

**GRADE 12 LIFE SCIENCE: A FACTOR IN THE ACADEMIC ACHIEVEMENT IN
BIOLOGICAL AND NATURAL SCIENCE IN BASIC NURSING STUDIES**

by

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for the degree of

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in the subject

HEALTH STUDIES

at the

UNIVERSITY OF SOUTH AFRICA

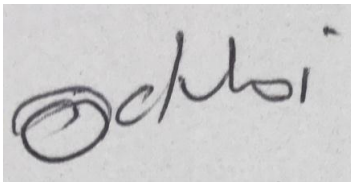
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NOVEMBER 2016

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DECLARATION

I declare that **GRADE 12 LIFE SCIENCE: A FACTOR IN THE ACADEMIC ACHIEVEMENT IN BIOLOGICAL AND NATURAL SCIENCE IN BASIC NURSING STUDIES** is my own work and that the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



16 January 2017

.....

SIGNATURE

Onica Mankebe Ndwambi

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DATE

GRADE 12 LIFE SCIENCE: A FACTOR IN THE ACADEMIC ACHIEVEMENT IN BIOLOGICAL AND NATURAL SCIENCE IN BASIC NURSING STUDIES

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ABSTRACT

The funding regimens of Higher education institutions (HEIs) present a challenge to every institution. It is expected that students who are selected to register for degrees or diplomas must be successful and obtain their qualifications in the minimum time required to ensure optimum subsidy for the institution. The throughput rates in higher education institutions remains of serious concern and emphasis on the selection criteria or prerequisites to enter a specific programme might be a possible factor in the throughput rates of students.

The aim of this study was to identify and describe whether basic nursing students who passed Grade 12 Biology, currently referred to as Life Science, with at least 50% was a factor in the successful completion of the Biological and Natural Science module (BNS 100) in their first year.

A quantitative research study was conducted in one government nursing college, Gauteng province in Tshwane region in South Africa. A checklist was used to collect data from the 2014 first-year student records and a questionnaire was used to collect data from the 2015 second-year students. No sampling was done since all the 2014 first-year students' admission records were accessed for data collection and all the available second-year students of 2015 were invited to participate.

The findings revealed that background knowledge of Grade 12 Life Science and English language proficiency could be associated with the academic performance in the BNS100 module of the basic nursing students. The findings might be used to make recommendations for possible prerequisites for entry into a nursing programme as well as to support students' education and training to ensure a reduction in student attrition rates and improve the shortage of nurses.

The findings motivated the researcher to recommend that the college under study, and other HIEs with similar concerns and student profiles should revise the selection and recruitment criteria for students to enter the basic nursing programme. This might contribute to selecting the correct prospective candidates who would have a better chance of completing their basic training in the four-year time as the expected period to complete the programme.

Key words

Life Science (Biology), Biological and Natural Science, academic achievement, basic nursing students

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Dedication

To Junior and Naledzani

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LIST OF ABBREVIATIONS

AACN	American Association Colleges of Nursing
ALC	Ascending Learning Centre
APS	Admission Point Score
BNS	Biological and Natural Science
CHE	Council for Higher Education
CHRE	Council for Health Regulatory Excellence
CNA	Canadian Nursing Association
DOE	Department of Education
DOHE	Department of Higher Education
DOH	Department of Health
EN/A	Enrolled Nursing Assistant
EN	Enrolled Nurse
FET	Further Education and Training
GPA	Grade Point Average
HEIs	Higher Education Institutions
HEQF	Higher Education Qualification Framework
HEQSF	Higher Education Qualification Sub-Framework
HESA	Higher Education South Africa
ICN	International Council of Nurses
IQ	Intelligence Quotient
IT	Information Technology
MIA	Multiple Intelligence Approach
NAB	National Accreditation Board
NEIs	Nursing Education Institutions
NQF	National Qualification Framework
NSC	National Senior Certificate
RNs	Registered Nurses
SANC	South African Nursing Council
SAQA	South African Qualification Authority
SAT	Standardized Admission Test
WHO	World Health Organization

CHAPTER 1

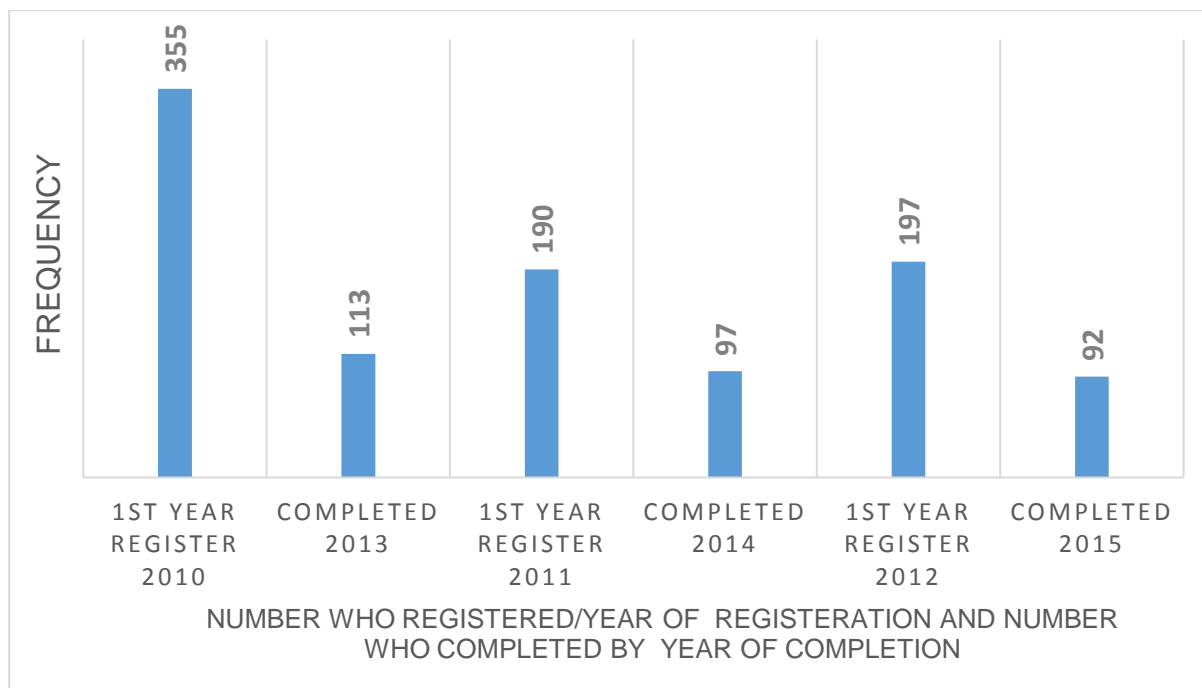
OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND TO THE RESEARCH PROBLEM

Any student who register for a degree or diploma at a higher education institution has the expectation that he/she will be successful in obtaining a qualification to enter the workforce (South Africa. DOHE and Training 2010). Funding regimens of Higher Education Institutions (South Africa. DOHE and Training 2010), also expected of students who are selected to register for degrees or diplomas to be successful and obtain the qualifications in the minimum time required (South Africa. DOHE and Training 2010) to ensure optimum subsidy for the institution. According to institutional assessment policies in South Africa, an average pass mark of 50% per subject is required, however, statistics indicated that students struggle to achieve the set standard (South Africa. DOHE and Training 2010), and the throughput rates at Higher Education Institutions (HEIs) remains a concern.

According to a report on Higher Education in the 20th year of democracy, the South African government aimed at increasing the enrolment rate from 17,3% to 25% (950 000 to 1,6 million) in 2030, but the graduation rate of undergraduate students remains a concern. Internationally the graduation rate in the year 2010 was an average of 25% compared to the 16% to 22% of African students (University World News 2014).

The throughput rate at Nursing Education Institutions, particularly in the college under study, is no different (see figure 1.1). Throughput rates need to be improved as the nursing profession is of dire need of more registered nurses to address the shortage of nurses (CHRE 2012).



**Figure 1.1 Completion rates within the minimum of 4 years from 2010 to 2013
(examination results of the college under study)**

As illustrated in figure 1.1, in the year 2010, 355 students were registered as first years and only 113 ($f=32\%$) completed within the minimum time of four years in 2013. In 2011, 190 students were registered and only 97 ($f=51\%$) completed within 4 years in 2014 and in 2012, 197 students were registered as 1st years and only 92 ($f=47\%$) students completed their training in 2015. The average completion rate within the minimum time of 4 years since 2010 was an alarming 43%.

1.2 STATEMENT OF THE PROBLEM

For most degrees and diploma programmes at Higher Education Institutions, specific entry requirements are needed for a student to be able to register. In most Health Sciences related university programmes prerequisites to be selected are that prospective candidates should have obtained a D symbol (old curriculum) in both English and Life Science, equivalent to level 4 rating in the National Senior Certificate and at least a rating of 3 in either Mathematics or Mathematical Literacy (South Africa. DOH 2014). Prior knowledge and/or experience are a known factor that contributes to performance and success (Aliakbari, Parvin, Heidari & Haghani 2015:5) contributing to these entry requirements. Life Science, a Grade 12 subject (previously known as Biology) lays a foundation for Biological and Natural Science, which is one of the

compulsory ancillary subjects in the education and training of basic nursing studies. However life science is not currently a pre-requisite for entry into the nursing programs in the college under study (South Africa. DOH 2014).

Failure of the BNS 100 and 200 modules contribute to the high number of professional nurses that complete their studies after 5-6 years instead of the minimum of 4 years. Background knowledge of Grade 12 Life Science might be a factor in the academic performance in Biological and Natural Science (BNS 100) module in the basic nursing studies and needed to be investigated, in order to make recommendations regarding possible implications for selection and recruitment of students into college nursing programmes.

1.3 AIM

The aim of this study is to identify and describe whether basic nursing students who passed Grade 12 Biology with at least 50% currently referred to as Life Science, as a subject was a factor in the successful completion of the Biological and Natural Science module (BNS 100) in their 1st year. The findings might be used to make recommendations for possible pre-requisites for entry into a nursing programme.

1.4 OBJECTIVES

To meet the aim of the study the following objectives applied:

- Described the performance of students' in Biological and Natural Science who have passed Grade 12 Life Science with at least 50%.
- Described the performance of students in Biological and Natural Science of students who did not pass Grade 12 Life Science with at least 50%.
- Describe 2nd year nursing students' perception of grade 12 Life Science on their performance in Biological and Natural Science, as they have already completed BNS 100 and are able to reflect on the module.
- Made recommendations pertaining to specific pre-requisites in the selection criteria for entry into the nursing programme.

1.5 THEORETICAL FRAMEWORK

Theory is a generalisation about variables and the relationships among them, in order to make decisions and predict outcomes (Cooper & Schindler 2014:61; Bless, Higeon-Smith & Sithole 2014:15). Learning theories are the frameworks of the structures and the principles that provide explanations about learning and their applications (Aliakbari, Parvin, Heidari & Haghani 2015:2).

The emerged general learning theories that are: behaviourism, cognitive and constructivism may be used separated or combined. Behaviourism believes that learning is a change in observable behaviour as a result of stimulus and response. Constructivism believes in exploratory learning (Aliakbari et al 2015:1), and the cognitive learning theory focus on prior knowledge and the effect of learning, thus of relevance to this study.

There are several theorists who support the cognitive learning approaches and gestalt is known as the leader of learning cognitive theorists. Cognitive psychologists believe that learning is associated with the change in capacity and capability of an individual to respond, whereas the fundamentalists believe that an individual should be equipped with questioning skills and problem solving to be able to learn actively (Aliakbari et al 2015:5).

The theological significance learning theory of David Ausubel is one of the well-known theories of cognition. The cognitive theory stipulates that new material should be consistent with prior knowledge of students to enhance learning (Aliakbari et al 2015:5). This theory was applicable as students with prior knowledge of Grade 12 Life Science might find the BNS content consistent with their prior knowledge of Grade 12 Life Science, which then will enhance learning and contribute to improved results. According to the cognitive theory, learning is an inductive process, starting from primary understanding of general concepts and continues to understand the specific details, and this has a close relationship with the students' previous knowledge and current learners' cognitive structure (Bless et al 2014:7). The content that is to be learnt in BNS is more or less the same as the content already learnt in Grade 12 Life Science, and it should serve as a foundation and continuity from where students left off in Grade 12.

1.6 DEFINITION OF CONCEPTS

Basic nursing student

The word basic means an essential foundation or starting point (*Oxford Dictionary* 2010:136). A basic nursing student is a student who have not yet completed the four year programme but is registered at the institution to be guided and facilitated to learn the art and science of nursing (Bruce, Rietze & Lim 2014:68).

Student nurse

A student nurse is a person who is registered at an institution for a four-year nursing programme in order to qualify as a Nurse (General, Psychiatry and Community) and Midwife (Gazette Regulation 425, as amended of 22 February 1985) (SANC 2015).

Life Science (Biology)

Biology is the study of the environment and everything that lives in it (Araoye 2013:1).

Academic achievement

Academic achievement is the ability to pass the set examination with a minimum mark of at least 50% (Araoye 2013:3).

Prior knowledge

Prior knowledge refers to a framework or structure that helps thinking (Allington & Cunningham 2010:1). Prior knowledge is defined as a multidimensional and hierarchical entity that is dynamic in nature and consists of different types of knowledge and skills (Haillikari, Katajavuori & Lindblon-Ylänne 2008:113).

1.7 OPERATIONAL DEFINITIONS

Basic nursing student

A basic nursing student is a student nurse who has not completed the 4 year nursing diploma program, but is registered in the Nursing College.

Student nurse

For the purpose of this study, a student nurse refers to a student in the first or second year of training and who are registered for the Biological and Natural Science module within the nursing programme.

Academic achievement

Academic achievement is the ability to obtain a minimum of at least 50% for tests and examinations in the Biological and Natural Science module (BNS 100).

Prior knowledge

Prior knowledge refers to a mark of at least 50% in Grade 12 Life Science because all modules at college level must be passed with at least 50% as an indication of achievement.

1.8 RESEARCH DESIGN

The research design was descriptive quantitative (Brink, Van der Walt & Van Rensburg 2010:102) which were utilised in this dissertation. The data regarding the performance in Biological and Natural Science (BNS 100) module of basic nursing students and their perception of this module were gathered in a quantitative way by means of a checklist (students' files) and a questionnaire (students' perceptions) respectively.

Achievements in Grade 12 Life Science were described as a possible factor in the successful completion of the BNS 100 modules.

1.8.1 Quantitative research

Quantitative research is a process that measures the behaviour, knowledge, opinion or attitudes; it may be used to test a theory (Cooper & Schindler 2014:146). This approach maximises objectivity by using numbers, statistics, structure and control (USCLibraries 2016:1).

For the purpose of this study the researcher characterised and described the background knowledge of Grade 12 Life Science (Biology) as a factor in the academic achievement in Biological and Natural Science (BNS 100) of basic nursing students.

1.8.2 Descriptive studies

Descriptive studies collect detailed descriptions of existing variables and used the data to justify, assess, help the policy administrators to analyse, plan, monitor and evaluate the current situations (Cooper & Schindler 2014:22).

In this study of the researcher described the factors such as age, gender, and type of schooling, home language as well as Grade 12 Life Science (Biology) and the academic performance in Biological and Natural Science module (BNS 100).

1.8.3 Population of the study

This study was conducted in one government nursing college in South Africa. The target population was the files of all first- year basic nursing students registered for the module Biological and Natural Science (BNS 100) and all the second year nursing students registered for BNS 200.

One hundred and ninety-three first year basic nursing students were registered for Biological and Natural Science (BNS 100) as one of their modules in their study programme and 200 students for BNS 200.

1.8.4 Sampling and sampling methods

The researcher opted for a non-probability sampling method because the study required study records as well as respondents who met the inclusion criteria. No sampling method was used to sample files or respondents who met the inclusion criteria of this study. The inclusion and exclusion criteria served as a guideline as to whom and what was to be included or excluded from taking part in the study.

1.8.4.1 Students' records

No sampling was done as all students' records of basic nursing students registered for their 1st year in 2014 of the college under study were included in the study. The sample size was 193 student records.

1.8.4.2 Respondents (students)

The sample was all the available basic nursing students in their second year basic nursing training who were registered for BNS 200 and who volunteered to take part in the study. No sampling was done as all the available students were invited. The sample included second-year students in 2015 (registered for BNS 200 as they already passed BNS 100). The sample size was the 147 respondents who volunteered to participate.

1.8.5 Research technique

A checklist was used to collect data from students' records and a questionnaire was used to collect data from the respondents (see Chapter 3, section 3.5.3).

1.8.6 Data gathering

After ethical approval to conduct the study was obtained from the Research Ethics Committee of the Department of Health Studies, permission was obtained from the Gauteng Department of Health, the Principal, research and ethics committee of the Nursing College under study, as well as from the individual respondents (see Chapter 3, section 3.5.4) (see Annexures A, C and E).

1.8.7 Validity

According to De Vos, Strydom, Fouché and Delport (2011:153), validity refers to sufficient control over variables and the extent to which the study results can be generalised. Face and content validity of both the questionnaire and the checklist were verified by the supervisor, a panel of experts who did the scientific review and the statistician who was responsible for the statistical analysis of the data (see Chapter 3, section 3.5.6.1).

1.8.8 Reliability

Reliability is the ability of a research technique to yield the same results should it be used in a different setting (De Vos et al 2011:153). The questions in the checklist as well as the questionnaire were unambiguous and easy to answer. Pre-testing was done on both the checklist as well as the questionnaire to ensure that questions were clear and easy to answer (see Chapter 3, section 3.5.6.2).

1.9 DATA MANAGEMENT AND ANALYSIS

The data analysis presented a summary of descriptive statistics. The academic performances in Biological and Natural Science (BNS 100) module, and Grade 12 Life Science (Biology) scores were described to analyse prior knowledge as a factor in BNS 100 module. The perceptions of the respondents with regard to their experience in studying the BNS 100 module were described.

1.10 ETHICAL CONSIDERATIONS

Written permission to conduct this study was obtained from the Research Ethics Committee, Department of Health Studies (UNISA); Gauteng Department of Health and the College Principal of the Nursing Institution under study (see Annexures A and C). The researcher adhered to the ethics principles required in research as described in Bless et al (2014:29) and all respondents were asked to volunteer to participate in the study. The principles were discussed in Chapter 3, section 3.6 (page 48).

1.11 SIGNIFICANCE OF THE STUDY

Results of the study can contribute to information that can inform the selection criteria of a nursing college in an attempt to enhance the throughput rates of nursing students. The researcher as an educator also gained valuable experience pertaining to the cognitive/model, the impact of prior knowledge as well as research methodology and the value of evidence based research. Future students may benefit as their chances of success might improve if the selection recruitment and support processes are improved.

1.12 CHAPTER LAYOUT

This study consists of five chapters.

Chapter 1: An overview of the study

The overview of the study introduced the reader to the background of the study; the statement of the research problem, the objectives of this study and a short introduction to the methodology followed.

Chapter 2: Literature review

The literature review provided information on the literature available on selection criteria into nursing programs, factors associated with students' success, nursing shortage, throughputs in higher education institutions, the cognitive theory as well as prior knowledge as a factor were also discussed.

Chapter 3: Research methodology

The chapter provided information on the research methodology followed in the study.

Chapter 4: Data analysis and interpretation

The data analysis and interpretation of both the data obtained from checklist and questionnaires were presented in this chapter.

Chapter 5: Conclusion and recommendations

The conclusion from all relevant findings as well as the recommendations will be discussed in Chapter 5.

1.13 CONCLUSION

The background to the research problem, statement of the problem, aim and the objectives of the study, theoretical background as well as the research design and the significance of this study formed the basis of Chapter 1.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses the literature review conducted for the study. The review covered the nursing shortage; nursing education; nursing education in higher education institutions, and selection criteria in relation to academic performance.

2.2 BACKGROUND

The throughput of nursing students to address the dire shortage of nurses and nurse educators is of paramount relevance to the nursing profession.

2.2.1 Nursing shortage

The American Associated Colleges of Nursing (AACN) (2013) estimated that the nursing workforce would increase from 2.71 million in 2012 to 3.24 million in 2022. Current and projected shortage indicators, however, indicate that this growth seems impossible since the current registered nursing workforce falls within only 55% of the projected values. The global analytical prediction indicated the shortage of registered nurses specifically in Southern and Western countries (AACN 2013). Not only is the shortage of nurses internationally of concern but also the turnover rates for registered nurses, the rapidly aging workforce as well as the low completion rates of registered nurses (RNs). These factors contribute to the current figure of 8.1% vacant registered nursing posts, directly related to the shortage of registered nurses (AACN 2013).

Sub-Saharan Africa alone needs almost 600 000 more nurses to be able to meet the average density coverage for low-income countries in order to achieve the Millennium Development Goals (WHO 2013:90). In particular, goal 7: environmental sustainability, impacts negatively on the health of the inhabitants of South Africa (WHO 2013:90). This situation adversely impacts further on the already strained health care delivery service (Botma, Greeff, Mulaudzi & Wright 2010:2).

In South Africa, the National Qualifications Framework (NQF) currently stipulates four categories of nurses, namely enrolled nursing assistants, enrolled nurses (EN), registered nurses (RN), and specialised registered nurses. The ratio of Registered Nurses (RNs) in South Africa is 1:401, but when the country's refugees and illegal immigrants are taken into account, the ratio escalates to 1:621. This ratio is of grave concern when compared to the WHO standard of 1: 200 (Bateman 2009:3; SANC 2014d; WHO 2013).

The distribution of the nursing workforce in Gauteng Province emphasises the shortage of nurses in South Africa. Table 2.1 indicates the total provincial distribution of nurses in Gauteng.

Table 2.1 Distribution of the nursing workforce in Gauteng Province

Registered nurse	Enrolled nurse	Enrolled nursing assistant
369:1	756:1	688:1

Source: SANC (2014d)

In 2010, the decline of nearly 42% in the total number of nurses who completed a 4-year programme at training institutions, and the 14,36% growth in the population further contributed to the shortage of registered nurses and the poor ratio in South Africa (Mokoka, Oosthuizen & Elhers 2010:2).

In an attempt to address this shortage of RNs in South Africa, the Department of Health (South Africa. DOH 2012, 2014) mandated nursing colleges to increase the intake of new nursing students by 25% per nursing college annually. The predicted goal was to increase the ratio of professional nurses from 98/100 000 to 130/100 000 population by the year 2025 (Essack 2012:831). A minimum of 1 000 nurses were supposed to complete their training annually, in order to reach the set target (South Africa. DOH 2014).

Currently nursing colleges are able to register 100 to 150 new students per college annually, depending on the availability of resources such as classrooms that can accommodate large numbers of students; available competent academic staff and

finances to educate and train nurses who will be competent quality oriented health practitioners (South Africa. DOH 2012). The increase in the number of students impacted negatively on nurse educators and institutions due to various challenges.

The shortage of nurses can only be curbed if the throughput rates of students are improved. Critical role players in nursing education and throughput rates are the nurse educators themselves, as well as educator / student ratios.

2.2.2 Nurse educator shortage

The global shortage of nurses is a crisis that continues to negatively impact health care delivery and is aggravated by a serious shortage of academically qualified faculty (nurse educators) available to teach in nursing education institutions (NEIs) (International Council of Nurses [ICN] 2015). This resulted in over 75 000 student nurse applicants, who complied with selection requirements, being turned away due to a lack of nurse educators and clinical placement opportunities, as well as an inadequate educational budget (Nardi & Gyurko 2015:317). In order to train more nurses, nurse educators are needed to ensure quality nursing education. According to the World Health Organization (WHO 2010:326), the nurse educator/student ratio in developing countries is as high as 1:45 compared to a 1:12 ratio in developed countries. In the United States the scarcity of nurse educators is expected to exceed one million by 2020.

Currently, South Africa has a nurse educator/student ratio at tertiary level of 1:46 compared to the ideal nurse educator/student ratio of 1:19 and 40% vacant nursing educators' posts (SANC 2014d; Department of Education [South Africa. DOE 2014b). In addition, South Africa has up to 40% vacant nursing educators' posts (AACN 2013). The fact that students fail to complete their training within the set minimum time of 4 years contributes to increased student numbers in the system which consequently worsens the ratios (South Africa. DOHE and Training 2010).

Nursing students need support and mentoring from competent nurse educators in order to enhance their competencies and knowledge and transform into professional nurses (Hillman & Foster 2011:51). The shortage of nurses and nurse educators not only plays a role in the throughput rates of students, but students need to comply with various aspects from selection to completion of the programme.

Student nurses trained at higher education institutions in South Africa have to comply with the expected outcomes of specific nursing programmes to be competent and safe practitioners (SANC 2014a). NEIs therefore need to produce more competent nurses, despite the shortage of educators, role models and factors associated with the students themselves.

2.3 HIGHER EDUCATION IN SOUTH AFRICA

Higher education refers to all the learning programmes, including nursing programmes that lead to a qualification that meets the requirements as stipulated in the Higher Education Qualification Framework (HEQF). In South Africa, higher education programmes are offered through universities, universities of technology, further education and training colleges (FET) and colleges affiliated with universities (South Africa. DOE 2014a).

Currently nursing colleges in South Africa are becoming part of the higher education environment as is the case in other countries (South Africa. DOH 2012; AACN 2013). This implies that all nursing programmes have to comply with the requirements set by the Department of Education (South Africa. DOE 2011), National Qualification Framework (NQF) and the South African Qualifications Authority (SAQA).

To ensure that national and internationally comparable qualifications guided by the *National Qualifications Act, 39 of 2008* are offered, the NQF classifies, registers, publishes and articulates the quality of all the programmes in South Africa. The NQF stipulates the total number of credits required per programme and ensures that the purpose of the programme is in line with the level descriptors as well as the programme exit outcomes to fit the standards set by the Council for Higher Education (CHE) (South Africa. DOE 2014b).

The purpose of these frameworks is to ensure that nursing programmes comply with the set criteria and standards so that successful candidates can be registered as professional nurses and midwives at the South African Nursing Council, the regulatory body for nurses in South Africa (R425).

Bachelor and Diploma programmes have different modules, with each module allocated a specific number of credits. A credit means the amount of learning contained in a qualification or part of a qualification whereby 1 credit is equivalent to 10 notional learning hours (SANC 2014c). Notional hours of learning imply the total amount of time it would take an average learner to meet the outcomes defined in a learning experience and include face-to-face contact time; experiential learning during clinical exposure; time during completion of assignments and research as well as time spent in assessment processes (SANC 2014c). Some nursing colleges, as is the case in the college under study, offer a diploma programme in nursing on NQF level 7 with a total number of 480 credits required. Bachelor degree programmes are offered on NQF level 8, with a total number of 480 credits (SANC 2014c).

Another important body in higher education is the South African Qualifications Authority (SAQA) that is responsible for the listing of all qualifications, the registration of standards as well as the development and management of the Higher Education Qualification Sub Framework (HEQSF) (South Africa. DOHE and Training 2010). The listing of qualifications is in accordance with the NQF. SAQA is regarded as the education and training quality assurer of all programmes including nursing qualifications in terms of section 5 of the *SAQA Act, 58 of 1995* (South Africa 1995). Higher education training is offered at various HEIs.

2.4 HIGHER EDUCATION INSTITUTIONS (HEIS)

In South Africa and other developing countries, HEIs refer to any institution that provides higher education on a full-time, part-time or distance basis and is established under the Department of Education (South Africa. DOE 2014a).

Higher education faces several challenges, and half of the world's higher education students are found in developing countries. This places a strain on an already underfunded system (Mogobe, Bruce & Meyer 2009:5). In South Africa, private HEIs are referred to as any institution registered as a private HEI in terms of chapter 7 of the *Higher Education Act, 101 of 1997*. Public HEIs refer to any HEI established or declared a public HEI under the *Higher Education Act, 101 of 1997* (South Africa. DOE 2014a). Public and private universities, universities of technology, nursing colleges and learning centres can form part of the higher education sphere.

Public institutions are funded by the government whilst private institutions are mostly funded from students' tuition fees and partly from the government (CHE 2010). Private institutions are mostly well equipped in terms of infrastructure and availability of resources compared to public institutions (CHE 2010).

The majority of students register with public institutions because students at private institutions pay high tuition fees (CHE 2010). In nursing institutions the government compels acceptance/admission of larger numbers of students thus many students register (South Africa. DOH 2014). The student/educator ratio of 46: 1 is unmanageably high and negatively influences throughput rates (SANC 2014d).

In South Africa, nursing education is offered at different types of institutions, namely universities, universities of technology, and private as well as state colleges or learning centres. Nursing colleges are affiliated with universities. The universities and universities of technology offer degrees whereas the colleges offer diploma and certificate programmes (SANC 2015).

In Ghana, like South Africa, universities are either state funded or private institutions and offer a four-year Bachelor's degree in nursing (Bell, Rominiski, Bam, Donkor & Lori 2014:244). Nursing colleges in Ghana are often affiliated with teaching hospitals and offer three-year diploma and nursing certificate qualifications. Degree and diploma nursing programmes in Nigeria and Ethiopia are the same (Dolamo & Olubiyi 2013:18, 20).

In Botswana, nursing degree programmes are offered at universities while Institutions of Health Science and mission training schools offer diploma courses, but they all are affiliated with the University of Botswana (Barchi, Singleton, Mogame & Shaiby 2014:493).

Training for nursing in the United States (USA) is offered through community nursing colleges which are licensed to offer one- and two-year nursing programmes. Nursing colleges and universities are the only HEIs that are licensed to offer Bachelor's degrees.

The basic approach globally is practically the same, with universities offering degree programmes and colleges offering diploma and certificate courses. The difference is the

type and level of offering of qualifications and the exit level outcomes: level 7 for the diploma and level 8 for the degree qualification. The exit level outcomes are the expected level of performance according to the level descriptors set by the NQF, which regulates and compare the quality of qualifications both nationally and internationally (SANC 2015).

2.4.1 Universities

In the UK, the selection criteria for Associate and Bachelor's degree programmes in nursing require applicants to have achieved at least a symbol C grade, which is equivalent to a Level 5 in South Africa and a Grade Point Average (GPA) of at least 2.7, as well as compulsory courses such as human anatomy and physiology; computer literacy; biochemistry; chemistry, psychology, microbiology and mathematics.

In Australia, a minimum score of 70% in National Tertiary Entrance Score is a prerequisite for entry into HEI programmes (Alusukunya 2013). These requirements also vary slightly from college to college.

In Ghana, prospective candidates are expected to have achieved a minimum score between A1 (80%-100%) and C6 (45%-49.99%) in the West African Senior Secondary School Certificate, with three compulsory subjects being Mathematics, Integrated Science, and English, as well as three other subjects related to the major career path (NAB 2015). Similarly in Nigeria, a minimum score of 50% in the Unified Tertiary Matriculation Examination is required and three other subjects related to the proposed major career path (Alusukunya 2013).

In South Africa, prospective candidates who want access to a degree programme in nursing at universities have to be in possession of a recognised National Senior Certificate (NSC) and have achieved a minimum of 50% in at least four subjects chosen from the designated list of NSC subjects (South Africa. DOE 2014a).

Selection criteria for Bachelor's degrees might differ slightly from one university to another in South Africa. Most universities require an Admission Point Score (APS) of at least 25 at the end of Grade 11 and at least 22 at the end of Grade 12, excluding marks obtained in Life Orientation. Recommendations include English as a language of

teaching and learning as well as an achievement of level 4 (50-59%) in Life Science, Mathematics and Physical Science (South Africa. DOE 2014a).

Some universities, like the University of the Witwatersrand (2015) and Rhodes University (2015), calculate their APS based on the seven best subjects. The University of Pretoria (2015) requires Mathematics or Mathematical Literacy; Physical Science or Life Science; English or Afrikaans, and any other three subjects excluding Life Orientation. The University of the Free State (2015) requires a minimum APS of 30 from the listed subject choice and only 1 mark from Life Orientation will be added to the APS of 30 if the level of achievement is above Level 5. The cut-off point for acceptance into an engineering course is 70% in Mathematics and 60% in Science at the University of North West (2015). Table 2.2 illustrates the calculations of APS for South Africa (South Africa. DOE 2014a) and Ghana (NAB 2015).

Table 2.2 Levels in terms of percentages to calculate APS

South Africa		Ghana	
Level achievement	Percentage achieved	Symbol	Percentage
Level 7	80-100	A1	80-100
Level 6	70-79	B2	70-79.99
Level 5	60-69	B3	60-69.99
Level 4	50-59	B4	55-59.99
Level 3	40-49	C5	50-54.99
Level 2	30-39	C6	45-49.99
Level 1	0-29	C7	40-44.99
		E8	35-39.99
		F9	0.0-34.99 (Fail)

Universities, then, require not only a level 4 (50%-59%) for English, but promote Life Science as a prerequisite for entry into the nursing programme, compared to nursing colleges which do not require Life Science as a recommended subject nor a mark of at least 50% for English. The exit level outcomes and the level of the qualifications, however, are different in the NQF as indicated in 2.4.

Students' selection and recruitment criteria vary between countries and institutions. Some countries make use of the Standardized Admission Test (SAT) or the American College Test Score. For example, Australia uses a National Tertiary Entrance Rank (Score) (Gakuen-Nishimachi 2010:1); Ghana uses the Senior Secondary School

Certificate and West African Senior Secondary School Certificate (Ghana Education System 2015); Nigeria uses the Unified Tertiary Matriculation Examination (Alusukunya 2013), and South Africa uses an Admission Point Score (APS) (DOE 2014a).

Australia requires a minimum of 50 points over 100 points to grant candidates college admission and a minimum of 70 points over 100 points to grant individuals university entrance (Gakuen-Nishimachi 2010:1)) while Nigeria requires a minimum of 50% (Alusukunya 2013).

In South Africa, the minimum admission requirements for entrance into higher education programmes are stipulated in the *Government Gazette*, (South Africa. DOHE and Training 2010). However, it is still the prerogative of the institution in terms of section 37 of the *Higher Education Act, 101 of 1997* to determine specific admission requirements for specific programmes. This means that every institution is allowed to develop and implement internal guidelines to suit different learning programmes. Hence different universities and colleges as HEIs have different selection criteria that will allow access to the institution and the selected programme, like a nursing programme (South Africa. DOHE and Training 2010)

Currently in South Africa the baseline for admission to a Bachelor's degree at HEIs is the achievement of a National Senior Certificate (NSC) according to the prescriptions in the NSC policy (South Africa. DOE 2014a). HEIs may specify their requirements for the particular field of study. For nursing programmes, a combination of recognised National Senior certificate subjects and levels of achievement may grant an individual admission to a Bachelor's degree programme. For example, prospective candidates who seek entry into a degree programme in nursing studies are expected to have performed satisfactorily in at least four compulsory subjects chosen from the designated list of NSC subjects and any other subjects from the additional subjects to obtain a minimum required APS (South Africa. DOE 2014a) (see Table 2.3). The selection criteria for various types of institutions offering different nursing programmes may or do vary.

Table 2.3 Designated lists of NSC subjects

Compulsory subjects	Additional subjects
English	Physical Science
Life Science	Economics
Mathematics or Mathematical Literacy	Geography
Life Orientation	History
	Information Technology
	Religious studies
	Music
	Engineering Graphics and Designs
	Consumer Studies
	Accounting
	Agricultural Science
	Business Studies
	Dramatic and Visual Arts

(Source: South Africa. DOE 2014a)

2.4.2 Nursing colleges

Nursing colleges adopted a different approach in selecting prospective candidates compared to universities. Psychometric tests and personal interviews as well as previous academic performance play a major role during selection of students for the diploma and certificates qualifications (Gillen 2012:5). The use of scenarios developed by a team of lecturers, clinicians, service users and students are valuable during the selection of college nursing students (Dray 2013:64).

In Ghana, the prospective candidates should have obtained a Senior Secondary School Certificate with a score of A (75%-79.99%) to C (60%-64.99%) in six subjects, three of which should be English, Mathematics and Integrated Science subjects (Physical Science and Chemistry) (Ghana Education System 2015). In Nigeria, a minimum of 5 point score credits in the Unified Matriculation Examination with subjects like English, Mathematics, Biology, Chemistry and Physics should have been achieved (Dolamo & Olubiyi 2013:18).

In South Africa, candidates who want access to a Diploma qualification in nursing colleges should be in possession of an NSC, with an achievement rating of at least level 3 (40%-49%) in four recognised NSC credited subjects (see table 2.3) and level 2 (30%-

39%) in the language of teaching and learning, which in the context of this study is English, and an APS of 24 only if the candidate has studied and passed Mathematics as one of the subjects and 25 in the case of Mathematical Literacy (South Africa. DOH 2014). The policy of Recognition of Prior Learning must be implemented for those candidates who are already employed by the Department of Health and would like to further their education and training in the nursing profession (South Africa. DOH 2014). The requirement for admission to diploma nursing programmes appears to be lower than for degree programmes at universities; for example, universities require 50-59% for English and colleges require 30-39%, thus a 20% less achievement is required.

There is a positive correlation between past academic achievements and current tertiary performance (Moreira 2012:117; Palmer, Bexley & James 2011:11). School achievements are commonly seen as the most important predictors of entry to higher education and subsequent success at tertiary level education (Li & Dockery 2014:11). Du Plessis and Gerber (2012:92) and Kowitlawakul, Brenkus and Dugan (2012:39) emphasise that a National Senior Certificate should be strengthened as an assessment tool for predicting success in tertiary education.

2.4.3 Learning centres

Many countries worldwide employ Polytechnics which are equivalent to learning centres. Learning centres' approach to student recruitment is the same as the Admission Point Score (APS) used in nursing colleges.

In Florida, USA, the polytechnic selection criterion is a grade point average (GPA) of 3:00 (83%-86%) or higher (Polytechnic Florida 2015). In Namibia, a credit score of 25 points and a symbol E (40-49%) or better in English are recommended (Polytechnic Namibia 2015).

In South Africa, learning centres are mostly private institutions like Life Health Care, Netcare Group, and Mediclinic. These institutions offer one- and two-year nursing programmes, such as Diploma for Enrolled Nurses, which is a Bridging Course (R683), a Certificate leading to Enrolled Nurse (R2175), and a Certificate leading to Enrolled Nursing Assistant (R2176). The selection criteria are a Grade 12 NSC, minimum score

of 40% or 50% in Mathematics or Mathematical Literacy and any science subject at level 4 or 40%.

In an examination of student retention and student success in high school, college and university, however, Mbavu (2011:94) found that the success of students' academic performance and achievement in tertiary institutions is multifactorial in nature.

2.5 REGULATORY BODIES IN NURSING

In order to strengthen nursing and midwifery all the relevant authorities that regulate the education and training of nurses should comply with the standards and principles set by the regulatory bodies in various countries worldwide. The global standards and principles are set by the International Council of Nurses (ICN) and the World Health Organization (WHO). Monitoring and evaluation of the standards and the principles of nursing education and training in European countries are directed by the Munich Declaration of 2000 (Keighley 2009).

The Second WHO Ministerial Conference on Nursing and Midwifery in Europe held in July 2000 in Munich addressed the unique roles and contributions of Europe's six million nurses and midwives in health development and health service delivery. The Conference signed the *Munich Declaration* to develop a legislative and regulatory framework in order to monitor the standards for professional nursing and midwifery education in Europe (Keighley 2009). Similarly, the aim of the Nursing and Midwifery Council in the UK is to protect the health and wellbeing of the public (CHRE 2012:7). However, the Canadian Nursing Association operates differently since each country develops its regulations either at a provincial or territorial level (CNA 2015). In the USA, the Higher Education and Opportunity Act of 2008 regulates the education system and quality is assured by accredited quality assurance agencies, which are monitored through the United States Secretary of Education (USA Department of Education 2015).

In Botswana, Ghana, Nigeria and some African countries, the statutory regulatory body is the Nursing and Midwifery Council of the country (Barchi et al 2014:493; Bell et al 2014:244; Dolamo & Olubiyi 2013:20). In Ethiopia, however, nursing education and quality is regulated by the Ethiopian Nursing Association (Dolamo & Olubiyi 2013:20).

The Ghanaian Ministry of Education regulates the education services under the jurisdiction of their *Education Act, 1961* (Ghana Education System 2015).

In South Africa, nursing is under the jurisdiction of the South African Nursing Council (SANC) (*Nursing Act, 33 of 2005*) (SANC 2005). The regulatory body monitors education and training standards of the nursing profession as well as acknowledges and accredits the nursing education institutions. Nurses also need to be registered with the council in order to be able to practise in South Africa.

2.6 ATTRITION RATES

The average global attrition rate of all students from HEIs for three- as well as four-year diploma and degree programmes, respectively, is approximately 25% (Bailey, Cloete & Pillay 2011:44). In the USA, the current attrition rate is 22% (American Council on Education 2010) compared to 16% in Botswana, 17.1% in Ethiopia and 13% in Ghana (Bailey et al 2011). In South Africa, the attrition rate is between 35% and 38% (Alusukunya 2013; CHE 2012:9).

However, attrition rates of nursing students in the USA is at least 37% compared to the low rate of 25% of nursing students in South Africa (Ascending Learning Centre 2012:5; Masango 2014:722), which is lower than the general average percentage (35%-38%) of all students in HEIs in South Africa.

Various factors contribute to the high dropout (attrition) rates and poor academic performance of nursing students registered at HEIs, such as more mature students with multiple responsibilities, diverse socio-economic backgrounds, language literacy and others (Cleland, Dowell, McLachlan, Nicholson & Patterson 2012:7; Bono 2011:2). Student selection and recruitment criteria might be a factor associated with the attrition rates at HEIs.

2.7 FACTORS ASSOCIATED WITH STUDENT SUCCESS

Academic performance is a multifactorial phenomenon, which includes educational persistence, motivation, and integration of good relationships amongst students, families and schools (Moreira 2012:117). Cognitive theory can also have an influence

on students' academic success in HEIs. The literature review described the following factors relevant to this study that can possibly have an influence on students' academic success in HEIs.

2.7.1 Academic preparedness

Academic integration and preparation are primary distinctive aspects of students' retention and success (Kowitlawakul et al 2013:40). Between 30% and 40% of all new students registering at tertiary institutions are not ready for reading and writing at a higher level (South Africa. DOHE and Training 2010). Inadequate preparation of students results in poor transition of students from secondary to tertiary learning, which then creates a gap between secondary and tertiary level of education (Mbavu 2011:92). Moreover, the fact that in South Africa 35% of first-year law students drop-out before the middle of the academic year could be an indication that students are under-prepared for the language demands of higher education (Ngwenya 2010:78; Nasima & Cloete 2011:16).

The school system, including the ever-changing curriculum design and language issues, affects the quality of education and academic preparedness of students in South Africa especially at the basic level of education (Du Plessis & Gerber 2012:83). The way schools prepare their students in terms of how to strike a balance between school work and socialisation and the ability to study independently significantly impacts their pathway to higher education (Fakude 2012:8). Under-preparedness is a multifaceted phenomenon which includes cognitive and socio-cultural dimensions which lead to poor education (CHE 2013:57).

Two factors that might contribute to student success are prior knowledge of subjects related to the nursing career path and English language proficiency.

2.7.1.1 Prior knowledge (cognitive theory)

Cognitive theory holds that new material should be consistent with students' prior knowledge to enhance learning (Aliakbari et al 2015:5). This theory is of relevance to this study since students with prior knowledge of Grade 12 Life Science might find the content of BNS 100 familiar.

According to cognitive theory, learning is an inductive process, starting from primary understanding of general concepts and continuing to understand the specific details. This has a close relationship with students' previous knowledge and their current cognitive level (Bless et al 2014:7). BNS 100 covers approximately the same content already learnt in Grade 12 Life Science, which should serve as a foundation and continuity from where students left off in Grade 12.

In South Africa, Grade 12 Life Science introduces learners (students) to human anatomy, physiology and biochemistry (Isaac, Chetty, Manganye, Mpondwane & White 2013). The first-year Biological and Natural Science (BNS 100) module covers the same content but at college level (*BNS Study Guide* 2015).

Background knowledge can be seen as the raw material that conditions learning as it acts as the mental hook for the lodging of new information, content and skills knowledge by providing students with the ability to link their prior knowledge to the topics, skills and competencies addressed in a classroom (Campbell & Campbell 2009:9). Therefore students' previous educational outcomes are the most important indicators of their future achievement (Allos, Caranto & David 2015:61; Tiruneh, Verburch & Ellen 2014:2).

In Singapore, Loo and Choy (2013:86) found that engineering students' self-efficacy had a positive correlation to their academic performance. Mathematics and the field of engineering are closely knit as both involve manipulation of numbers, critical thinking and problem-solving experience therefore students with a strong background in Mathematics did well in engineering subjects (Loo & Choy 2013:92). Similarly, a significant background in Life Science should enable students to perform well in BNS 100 and consequently contribute to students' throughput rates.

Hailikari, Katajavouri and Lindblon-Ylänne (2008:1) examined the relevance of prior knowledge in learning and instructional design among students in pharmaceutical chemistry and found that knowledge from a previous course significantly influenced their achievements. At graduate entry medicine prior knowledge was found to confer short-term benefit to some students. For instance, students who obtained A Level in Mathematics achieved better performance in several modules, and students who obtained A Level in English also showed improved performance (Bodger, Byrne, Evan,

Rees, Jones, Cowell, Gravenor & Williams 2011:4). McBride-Henry and Van Wissen (2010:27) explored confidence and achievement among nurses undertaking a postgraduate biological science course. The study found that due to their prior knowledge of the elements of physiology, biochemistry, genetics, and pharmacokinetics, the nurses did not find the course difficult or anxiety-provoking (McBride-Henry & Van Wissen 2010:27).

2.7.1.2 Language proficiency-writing, reading and comprehension

In order for students to succeed academically in any form of study, they should be able to read and write and understand the concepts (Kola 2014:278). Individuals' writing skills are built on their ability to speak, read, and write. The spoken and written forms of a language tend to correspond and influence each other. Good English language results should be used as an essential prerequisite in admission to higher education. According to South Africa. DOHE and Training (2010)., among the challenges facing education in South Africa is that 30% to 40% of all new students enrolling at tertiary institutions are not ready for reading and writing at higher level. Regarding the language proficiency of first-year students, Bharuthram (2012:205) maintains that the teaching of reading across the curriculum in higher education might be necessary. There is a strong correlation between reading proficiency and academic success at all stages of life. Poor ability to read and digest course material and literature impacts negatively on students' performance as comprehension is critical in fostering the analysis and evaluation of any information (Bharuthram 2012:205, 210; Berndt, Petzer & Wayland 2014:31). Students need to be able to read and understand what they read to enable them to learn effectively.

Learning in one's own language increases access and equity; improves learning outcomes; reduces repetition and dropouts, and lowers overall costs (World Bank 2005:2). In Iran, English language proficiency in tertiary students was found to significantly correlate with their academic success (Sadeghi, Kashanian, Maleki & Haghdooost 2013:2316). At the college under study, however, only an achievement of 30% is required to enter and most of the students are African whose home languages are vernacular. Nevertheless, appropriate attitude and behaviour are associated with effective learning habits (College admission records 2014). In 2010, Ngwenya (2010:78) found that South Africa, 35% of first-year law students, mainly Black students, dropped

out before the middle of their academic year due to poor proficiency in the English language.

Furthermore, Affleck (2013:9) found a marked decline of 28% to 39% in language literacy levels in the youth of the 21st century, which is attributed to excessive use of slang language, “SMS” speak and text use of technology. Affleck (2013:9) adds that this contributes to inadequate mastering of language usage which, in turn, affects academic performance. Students who are digital natives, who constantly use social media to communicate, also register for programmes where the medium of education is not their mother tongue (home language), which inhibits or negatively affects academic performance.

In the college under study, the current prerequisite is level 2 (30-39%) for English and level 3 (40-49%) for Life Science (South Africa. DOH 2014). This low requirement for two of the essential aspects, namely language proficiency and prior knowledge, possibly contributes to students’ poor academic performance in BNS 100. Cognitive theory supports the notion that prior knowledge contributes to students’ successful academic performance (Aliakbari et al 2015:5). Consequently, it is necessary to assess all the background knowledge of Grade 12 Life Science and English language proficiency for all new students applying for the nursing programme. The two subjects might impact on the BNS 100 academic performance.

2.7.2 Motivation

Motivation impacts on students’ engagement with their studies and engagement affects academic achievement, thus poor motivation adversely affects academic performance. The more motivated the student, the higher the possibility of academic achievement and success (Brandt 2009:16).

Students, who are committed to their educational goals, are more likely to complete their courses than those who lack commitment (Babli, Rashmi & Sapha 2013:127). Both external and internal motivating factors in academic success have an impact on performance at tertiary level of education.

Elements such as involvement in learning, curiosity about learning new information and challenges of a subject content are associated with intrinsic motivation, whilst compliance, recognition and competition are associated with external drive. Externally driven students tend to perform less academically compared to internally driven students (Williams & Williams 2014:23).

2.7.2.1 Internal motivation

Although outside the scope and objectives of this study, it is important to mention some internal motivational factors that also influence academic performance as identified from the literature review.

- *Emotional intelligence*

Emotional intelligence is one of the internal motivating factors for students' academic success and correlates with high levels of academic achievement (Babli et al 2013:127). Therefore students should appraise a situation correctly, react appropriately in a difficult situation, and exercise stress tolerance when making judgments about academic decisions (Babli et al 2013:129).

- *Affective factors*

Affective factors such as attitudes affect achievement. A negative attitude imposes limitations on academic achievement (Fakude 2012:11). Students, who believe in themselves, develop positive attitudes and work harder therefore it becomes easier for them to achieve their academic goals compared to students with negative attitudes who are pessimistic most of the time.

- *Self-concept and self-esteem*

Self-concept and self-esteem build confidence, which improves academic achievement (Fakude 2012:11). Students with high self-esteem are able to take criticism positively, learn from their mistakes and strive for excellence. Students with low self-esteem, however, are often afraid to take calculated risks and give up easily, which leads to poor academic performance.

- *Cognitive factors*

Fakude (2012:11) maintains that cognitive factors play an important role in student success. It is believed that an intelligent child will perform better than a less intelligent child based on an intelligence quotient (IQ) average score.

2.7.2.2 External motivation

This study did not examine all external motivational factors, but it is important to note their relevance to student success.

- *Peer groups*

In Brisbane, Nelson, Quinn and Clarke (2011:2) found that peer groups serve as an external motivation to encourage students to put more effort into their studies. Another measure that may possibly be of assistance to support student learning and understanding of concepts and content is “friend-based grouping” of students in classrooms (Brandt 2009:20). This type of grouping helps students to focus and be relaxed, and such environment is ideal for learning to take place.

- *Laboratory experiment groupings*

“Hands-on-activities” like laboratory experiment groupings strengthen the relationship amongst peer groups and through mutual understanding of different personality traits the learning environment becomes conducive (Brandt 2009:20). The students’ participation in different group activities encourages them to compete for completing the delegated tasks.

Students who face increased workloads and have high stress levels may experience difficulty in coping with new social and academic demands of higher education and their academic achievement will be negatively impacted (Fakude 2012:14).

2.7.3 Demographic factors

Demographic factors, like gender and age, influence students' academic performance and success.

2.7.3.1 Gender

Nursing is still a female-dominated profession. There are more female nurses than male nurses even though in the USA there has been a remarkable increase of male nurses from 2,7% in the 1970s to 9,6% (330 000) in 2011 (Jaslow 2013). South Africa has a total of 124 399 female RNs and 12 455 male RN, which means that there are 111 944 more females than male RNs (SANC 2014d). Consequently, there are more female nurse educators (13 394) in South Africa than male educators (635) (SANC 2014d).

Males are more likely to obtain lower marks than female students in nursing programmes, although there are male students who complete their tertiary education in the nursing profession. In Physics, Kola (2014:278) found that males' performance was no different to females' performance. In health science-related courses like medical technicians and medicine, there was no difference in male and female students' performance (Alhajraf & Alasfour 2014:93; Remali, Ghazali, Kamaruddin & Kee 2013:1940).

In Nigeria, Okafor and Egbon (2011:10) found that male students performed better than female students in subjects requiring quantitative ability such as engineering, although this could not be linked to nursing students.

2.7.3.2 Age

In 2011, a New Zealand analysis of tertiary sector performance found an increase in people aged between 25 and 34 years obtaining degree and diploma qualifications in Western countries (Tertiary Sector Performance Analysis, Ministry of Education 2012). It was concluded that the more mature individuals become, the more focused and goal-driven they are as well as that at an older age they might have better access to resources, like financing themselves (Tertiary Sector Performance Analysis, Ministry of Education 2012).

2.7.4 Resources

The availability of human and material resources can also impact on students' academic performance (Phillips 2014:1). In this regard, family background and socioeconomic status play an important role.

2.7.4.1 Finance

Family and personal finance have an effect on academic achievement.

Family income impacts on the ability to afford tuition fees, study materials and other supportive teaching aids for their children. Students from low-income families may perform poorly as they have fewer resources, like textbooks to prepare for assessments (Ford 2013:4). Bigger families have more responsibilities and fewer resources available to financially support students (Eick, Williamson & Heath 2012:1299). In many cases, students whose parents are unable to provide adequate sponsorship for their education, are easily distracted as they most often lack study materials and have to rely on others to assist them (Adeyema & Kuyuro 2013:75).

In the USA, Ford (2013:4) found that low socioeconomic status and diverse cultural backgrounds led to students finding it difficult to socialise within the HEI context because some aspects conflicted with their own cultural beliefs and value systems. They also had problems understanding that institutions are career-oriented and therefore found it difficult to adapt to the values and beliefs of the institution. These factors might prevent students from adjusting to the campus climate and result in disengagement from their studies (Johnston, Quinn & Syed 2010:1). Johnston et al (2010:5) emphasise that the ability to socially integrate within the campus culture is important in the retention of students.

Kistnasamy (2014:383) investigated the power of extrinsic motivation in tertiary education and found that the millennium students have their own challenges: they often want to belong to a particular social class, look good, dress smartly and be in possession of smart gadgets. Failure to afford that type of life may lead to depression and failure to concentrate in class hence poor academic performance (Kistnasamy 2014:384).

2.7.4.2 Teaching resources

Education and training involves great effort from all the stakeholders. This includes factors such as technology, laboratories, libraries, educators and the learning environment.

- *Technology*

Information technology (IT) in education focuses on hardware, software and information searching using digital resources (Gretes 2013:3). The millennium students are exposed to a variety of technology which is beneficial in teaching and learning. The use of computers, Internet, videos and social media relevant to enhance understanding of BNS module could be viewed as aspects that can assist in the improvement of students' throughput rates.

- *Laboratories and simulation laboratories*

In order to demonstrate some aspects which may enhance understanding in the BNS module, a laboratory is an important resource to support teaching and learning (Brandt 2009:20).

In a randomised trial of the effect of simulation teaching on baccalaureate nursing students' self-confidence related to peripheral venous catheterisation in children, Valizadeh, Amin, Faith-Azor, Ghiasvandian and Akharzadeh (2013:158) found that simulation increased self-confidence, learning opportunities, decision making and critical thinking abilities. Consequently, the BNS educators have identified simulation as one of the teaching strategies that can provide nursing students an opportunity to learn anatomical structures from the models.

With regard to factors that influence medical students' academic performance and impact on patient care, in a simulation laboratory context, scenario-based discussion groups helped students to integrate their prior knowledge with new information that led to a better understanding of new information (Shawwa, Abulaban, Medrad, Baghlaf, Algethami, Abu-Shanab & Balkhoyor 2015:66; Aebersold & Taschannen 2013:6).

Highly motivated students always strive to perform and achieve to the best of their abilities and external motivating factors increase their self-esteem and confidence (Fakude 2012:12 & Howey 2015:3). In the simulation laboratory, the students who are externally motivated are given an opportunity to showcase their capabilities and their potential to be creative in learning. Therefore, the models in the simulation laboratory may be used to design flow charts to enhance understanding of different functioning of the body systems.

- *Library*

A well-equipped library with accessible Internet is needed to enhance students' ability to grasp abstract physiological concepts through animation. Interactive biology lessons from videos can assist with understanding of these concepts (Sharon, Pelaez, Chang & Weiner 2012:187). BNS modules or studies require knowledge of the physiology of the human body as well as biochemistry and therefore a library needs to be equipped with supporting materials and resources to enhance the transfer of learning (Gretes 2013:2).

- *Educators*

Prior knowledge of the educators and their learning experiences are critical to ensure that they can assist students to understand the content of a module. Reflectivity for the educators is seen as a prerequisite for understanding the essence of teaching, as teachers learn through collaborative reflective discourse with colleagues in order to share their experiences and ideas to enable them to assist their students.

Colleges fail to attract highly qualified and skilled nurse educators as they cannot afford to pay reasonable salaries (South Africa. DOHE and Training 2010)).

- *Learning environment*

Public nursing colleges are under-resourced in terms of material resources. In many institutions, the students are overcrowded in small teaching venues, which are not well ventilated; audiovisual teaching aids are frequently malfunctioning; libraries have limited books and access to e-resources, and there is a lack of laboratories and simulation laboratories (South Africa. DOHE and Training 2010).

A learning environment that is conducive to learning should be safe and accessible. The environment should be physical, mental, emotional and spiritual and should reflect openness and freedom to learn from one's mistakes (Williams & Williams 2014:15).

The **physical** environment refers to the geographical location of the institution, the availability of public transport to access the institution and the size and ventilation of the teaching venues. The physical structure of a classroom is a critical factor that affects students' morale and learning. Students should be involved in the process of creating their own environment in order to empower them and increase their motivation to study. (Phillips 2014:4). The teaching environment should also match the objectives of the lesson, both in terms of human interaction and the educators' instructional approach (Phillips 2014:4).

The **mental** environment refers to the state of mind of the students. Students should be free from psychosocial stressors, such as personal, family and financial matters, in order to be able to focus with fewer distractions whilst in class for improved academic performance.

An **emotional** environment refers to a good state of health. When students feel good about themselves and have positive attitudes towards their studies, they are more likely to achieve good results academically.

A **spiritual** environment allows students to connect with their souls. Spiritual fulfilment enhances drives and motives and students develop a sense of belonging and acceptance that could possibly improve academic success.

A motivated and positive educator is able to control the classroom and get the classroom organised in order to enhance teaching and learning for both educator and students (Hannah 2013:1).

2.8 CONCLUSION

To address the dire need for more qualified nurses, the South African government mandated NEIs to increase the total number of new student nurses accepted into the nursing programs (South Africa. DOHE and Training 2010). However, to address the

critical nursing shortage, the correct students need to be recruited and accepted in NEIs, to ensure that they complete their studies within the limited time allocated.

Currently many students are selected, but the attrition rates remain of grave concern. Many factors contribute to the high attrition rates, but this study focused on prior knowledge, with specific reference to background knowledge of Grade 12 Life Science.

Chapter 3 describes the research design and methodology of the study.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Chapter 2 discussed the literature review conducted on the nursing shortage; nursing education; nursing education in HEIs, and selection criteria in relation to academic performance. This chapter describes the research design and methodology of the study.

3.2 AIM OF THE STUDY

The aim of this study was to identify and describe whether passing Grade 12 Biology (currently referred to as Life Science) with at least 50% was a factor in basic nursing students' successful completion of the Biological and Natural Science module (BNS 100) in their first year. The findings might be used to make recommendations for possible prerequisites for entry into a nursing programme.

3.3 OBJECTIVES OF THE STUDY

To achieve the aim, the objectives of the study were to:

- Describe the performance of students in Biological and Natural Science who passed Grade 12 Life Science with at least 50%.
- Describe the performance of students in Biological and Natural Science who did not pass Grade 12 Life Science with at least 50%.
- Describe second-year nursing students' perception of the effect of Grade 12 Life Science on their performance in Biological and Natural Science, as they had already completed BNS 100 and were able to reflect on the module.
- Make recommendations pertaining to specific prerequisites in the selection criteria for entry into the nursing programme.

3.4 RESEARCH DESIGN

A research design refers to “the process of focusing on the end product and all the steps in the process to achieve the outcome anticipated” (De Vos et al 2011:142). The researcher chose a descriptive quantitative research design as appropriate for the study (Brink et al 2010:102).

3.4.1 Quantitative

Quantitative research measures behaviour, knowledge, opinions or attitudes, and may be used to test a theory (Brink et al 2010:102). Quantitative research describes relationships, differences and cause-and-effect interactions between variables (LoBiondo-Wood & Haber 2010:584). This approach maximises objectivity by using numbers, statistics, structure and control (Coetzee 2011:22).

3.4.2 Descriptive

Descriptive studies collect detailed descriptions of existing variables and use the data to justify and assess current situations or to make plans to improve practice (Brink et al 2010:102). Descriptive studies use data to justify and assess a current situation in order to come up with innovative and creative ideas to better the existing phenomenon (LoBiondo-Wood & Haber 2010:198).

In this study, the researcher described the respondents' age, gender, and type of schooling; home language; Grade 12 Life Science (Biology), and their academic performance in BNS 100. The focus was on the academic performance in BNS 100 of basic nursing students who studied and passed Grade 12 Life Science with at least 50% and those who did not study it or passed with less than 50%. The influence of prior knowledge of Grade 12 Life Science of first-year basic student nurses registered for BNS 100 was considered a factor in the academic performance in BNS 100.

The researcher, therefore, took the following factors into consideration: the respondents' academic achievement in BNS 100 and background knowledge of Grade 12 Life Science; admission point score; age; gender; public or private schooling; English language proficiency; socioeconomic factors; academic preparedness; resources and

students' motivation, in order to obtain information that might be linked to passing the BNS 100 module. The respondents' perceptions of whether the background knowledge of Grade 12 Life Science had an influence on their academic performance in BNS 100 were also described. The purpose was to possibly address the selection criteria of colleges of nursing. Table 3.1 indicates the factors taken into consideration.

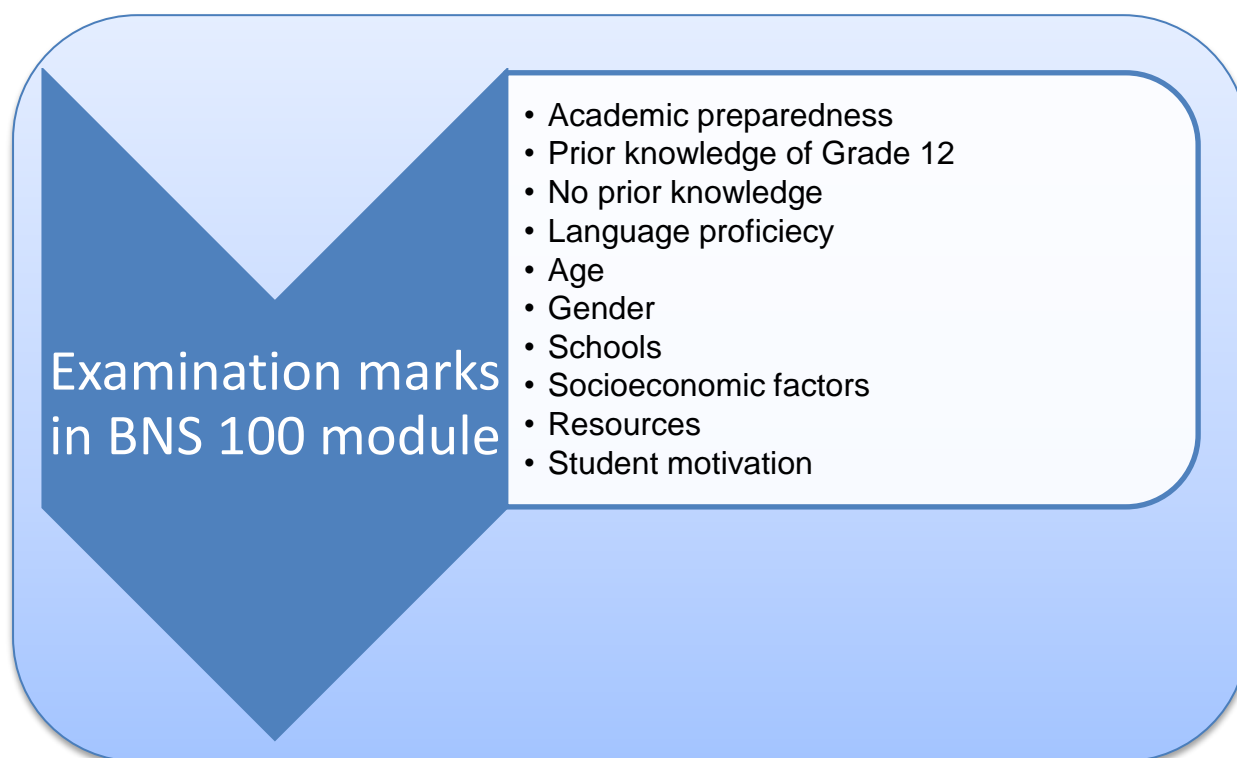


Figure 3.1 Factors taken into consideration in assessing respondents' academic achievement in BNS100

3.5 RESEARCH METHODOLOGY

Research methodology refers to the steps, procedures and strategies taken to investigate the problem being studied and to analyse the collected data (Polit & Beck 2012:273). The research methodology includes the setting; population; sample and sampling; data collection and analysis, and validity and reliability.

3.5.1 Setting

The study was conducted in one government nursing college in South Africa. The researcher selected the nursing college because lecturers raised the concern and

requested that it be investigated. This study was therefore conducted in a specific context with a possibility of being able to transfer the findings to other nursing colleges in South Africa.

3.5.2 Population

A population refers to the entire aggregate of cases in which a researcher is interested (Polit & Beck 2012:273). The population was all first- and second-year basic nursing students registered for the Diploma in General Nursing Science (Community health nursing science and Psychiatric nursing science) and Midwifery in the selected government nursing college.

The target population was the files of all first-year basic nursing students registered for the module Biological and Natural Science (BNS 100) and all the second-year nursing students registered for BNS 200. Records of students registered for the BNS 100 module in their study programme and second-year students registered for BNS 200 formed the population.

A total of 193 first-year basic nursing students were registered for BNS 100 as one of their modules in their study programme and 200 second-year students were registered for BNS 200.

3.5.2.1 Students' records

The accessible population was 200 records, which included the records of 1st year basic student nurses who were registered for BNS 100 in 2014.

The records were grouped as students who passed Grade 12 Life Science with $\geq 50\%$ (operationalised as having prior knowledge) and those who failed it, or did not study it (operationalised as without having prior knowledge). Data on academic achievements in BNS 100, as well as on admission information such as prior knowledge, no prior knowledge, English language proficiency, age and gender were captured.

3.5.2.2 Respondents

The population was 200 students who were registered for the module Biological and Natural Science (BNS 200) in 2015 in the selected government nursing college in Gauteng Province, Tshwane Region. Only second-year basic student nurses participated in this part of the study as they had prior knowledge of BNS 100 and were able to communicate their experience of prior knowledge of BNS 100. Data was collected when the first-years were still at the beginning of their academic year and did not have sufficient experience to reflect on their perceptions of the BNS 100 module and how their Grade 12 background knowledge of Life Science might have affected their achievement in BNS 100 examination.

3.5.3 Sample and sampling

Sampling is the process of selecting a part of the population to represent the total population (Polit & Beck 2012:290). The researcher opted for non-probability sampling because the study required study records as well as respondents who met the inclusion criteria. In non-probability sampling, the researcher selects participants based on personal judgement about which ones will be the most informative.

No sampling method was used to sample files or respondents who met the inclusion criteria of this study. Inclusion and exclusion criteria refer to characteristics that restrict the population to a homogeneous group of respondents (LoBiondo-Wood & Haber 2010:557). The inclusion and exclusion criteria served as a guideline on who and what to include or exclude from taking part in the study.

All the available admission records of first-year students registered in 2014 who were registered for the BNS 100 module were used. The sample size was 193 students' admission records. The records were categorised as students who studied and passed Grade 12 Life Science with $\geq 50\%$ and ones who did not study it, or passed with $< 50\%$ as well as the academic performance in BNS 100.

The respondent sample consisted of all the available second-year basic nursing students who were registered for BNS 200. No sampling was done as all 200 students

were invited to participate. Of the students, 147 gave informed consent to voluntarily participate in the study.

3.5.4 Data-collection instruments

The researcher collected quantitative data on the BNS 100 students' performance in and perception of this module by means of a checklist and a questionnaire, respectively. A checklist was used to collect data from students' records and a questionnaire was used to collect data from the respondents.

3.5.4.1 Checklist

A checklist is a type of questionnaire, consisting of a series of closed items to which a data-capturer or researcher responds by ticking the correct boxes (De Vos et al 2011:186). The researcher developed the checklist with the assistance of a biostatistician (see Annexure F). The checklist items covered students' gender, age and type of high school attended; English language proficiency; academic achievement in Grade 12 Life Science, and academic achievement in BNS 100 (passed or failed at first attempt and / or supplementary examination).

3.5.4.2 Questionnaire

A questionnaire is "a document containing questions and other types of items designed to obtain information that is appropriate for scientific analysis" (De Vos et al 2011:186). The researcher developed the questionnaire based on the literature review in order to achieve the objectives of the study.

Questionnaires have several advantages (Brink et al 2010:147; Botma et al 2010:135; Coetzee 2011:70):

- Questionnaires are less expensive in terms of time and money. The respondents were gathered in a venue at a specific time, which they agreed on to complete the questionnaires. No extra travelling expenses or postage costs were incurred.

- Questionnaires enhance validity and reliability. The same tool tested in the pilot study was used in the main study. The instrument was evaluated by a statistician and a scientific review committee.
- Questionnaires allow respondents to experience a sense of anonymity as they do not have to include their names on the questionnaire. The respondents did not provide names so no information could be linked to any respondent. The respondents answered the same standard questionnaires.
- Questionnaires are easy to distribute and collect. A total of 147 questionnaires were distributed and completed within one hour. A 100% response rate was therefore achieved.
- Questionnaires enable a researcher to collect empirical data. The respondents had first-hand information on their experience in the BNS 100 module. Analysis was explicit and results were verifiable as they were supported by statistical findings.

Questionnaires also have certain disadvantages (De Vos et al 2011:189; Brink et al 2010:147; Botma et al 2010:135):

- Questionnaires can be costly to print and post. The researcher obtained a bursary that covered the expenses for duplication and distribution of the questionnaires. No postage costs were incurred because the questionnaires were distributed and completed during the respondents' scheduled block period.
- Questionnaires allow respondents to provide socially acceptable answers. However, the respondents were asked to respond as individuals and to be as honest as possible as their information could not be linked to their identity.
- Respondents need to be literate to complete a questionnaire. All the respondents were students registered at the NEI and therefore literate.
- All respondents need to meet the inclusion criteria. This was possible as the questionnaires were distributed only to second-year students registered for the BNS 200 module.
- Questions that might be misunderstood cannot be clarified, and the researcher will not know whether the response was made in full understanding of the question. The questionnaire was tested in a pilot study and refined according to the feedback received.

3.5.4.3 Development of the questionnaire

Questionnaires are developed to identify the desired information required in order to answer research questions (Burns & Grove 2009:406). The researcher developed the questionnaire based on the literature review, which covered the nursing shortage; nursing education; nursing education in HEIs; the cognitive model; factors associated with academic performance, and selection criteria in relation to academic performance.

The questionnaire consisted of 11 questions and was divided into three sections. Section A covered the respondents' demographic profile including gender, age, marital status, language spoken at home, type of schooling and place of residence (accommodation) during training. The purpose was to examine whether these factors influenced their academic performance.

Section B covered the respondents' prior knowledge of Grade 12 Life Science as a factor in academic performances in the BNS 100 module. This section examined the respondents' symbol obtained in Grade 12 Biology (Life Science) and their perceptions of Grade 12 Life Science as a factor in academic achievement in BNS 100.

Section C focused on the respondents' perceptions of their performance in BNS 100; Grade 12 Life Science pass with $\geq 50\%$ as a possible prerequisite for admission in basic nursing studies, and the value of Biology / Life Science as a subject during nursing training.

3.5.5 Data collection

Data collection is the precise, systematic gathering of information relevant to the purpose or objectives of a study (De Vos et al 2011:151). The researcher collected quantitative data on the first-year students' performance in BNS 100 by means of a checklist, and the second-year respondents' perception of this module, using a questionnaire. A checklist was used to collect data from students' records and a questionnaire was used to collect data from the respondents.

The students' records were perused to collect data using the developed checklist. The researcher was assisted by two college staff members in the Student Affairs Department to maintain confidentiality of sensitive information and to ensure the accuracy of the data collected. One of the staff members assisted with retrieving and returning the files from the shelves and the second assisted by checking that the researcher captured the data correctly. No files were taken out of the archive room. It took the team (the researcher and the two college staff members) two days to complete the data-capturing process. A class attendance list was checked to ensure accuracy.

The educators involved in BNS 200, who acted as gatekeepers, distributed invitation letters (see Annexure D) to all the students as part of recruitment with the assistance of college management. The researcher secured a date and time on the students' class roster for the respondents to complete the questionnaires. The respondents were informed of the date, time and venue.

On the day of data collection, the Student Affairs Officer went to the Auditorium of the college under study where the students gathered at 7 o'clock (07:00), before classes commenced to avoid interference. The staff members assisted with distributing information letters (see Annexure D), consent forms (see Annexure E) and questionnaires (see Annexure G) to all the students. The Student Affairs Officer explained the purpose of the study to the students and informed them that participation was voluntary and that they had the right to withdraw from the study at any time without explanation or penalty should they so wish. They were informed of their right to anonymity, confidentiality and privacy. Students were allowed time to leave the venue should they choose not to participate. The students were free to participate or not without the presence of the researcher as it could have interfered with data collection and to ensure that they would not be victimised by the researcher (who is a lecturer in the college) for their choice to participate or not. Those who wished to participate then signed the informed consent forms (see Annexure E) and completed the questionnaires. The completed questionnaires were deposited in designated boxes and collected by the student affairs officer. The sealed boxes were handed over to the researcher immediately after the process was completed for data capturing.

3.5.6 Validity and reliability

Validity and reliability are important measures to ensure the credibility of any research study and enhance rigor in quantitative research (Polit & Beck 2012:625). In quantitative studies the quality of tools determines the validity and reliability of the findings, provided sources of bias are controlled (LoBiondo-Wood & Haber 2010:198).

3.5.6.1 *Validity*

Validity refers to sufficient control over variables and the extent to which the study results can be generalised (De Vos et al 2011:153-156). In this study, the face and content validity of the checklist and questionnaire were verified by the researcher's supervisor; the Research Ethics Committee, Department of Health Studies (UNISA); the Scientific Review Committee in the Department of Health Studies, and the BNS lecturers of the college under study. The statistician also verified the coding of the checklist and the questionnaire.

- **Face validity** is a measure of how representative a research project is at “face value” and whether it appears to be a good project or refers to the transparency of a test as it appears to test participants (Holden 2010:637).
- **Content validity** is the estimate of how much a measure represents every single element of a construct (Holden 2010:637). The content of the checklist focused on data that was related to the academic achievement in Grade 12 Life Science and academic performance in BNS 100, as well as other relevant factors.
- **Construct validity** defines how well a test or experiment measures up to its claims (Chetty 2014:4). The analysis of the captured data was done by the statistician for accuracy using SPSS statistical software program version 23 and the achievements of Grade 12 Life Science were compared to the academic performance in BNS100 examinations marks.
- **Internal validity** ensures that a research experiment design closely follows the principle of cause and effect (Chetty 2014: 4). Five students' files from first-year 2015 (BNS 100) nursing students were piloted to strengthen the validity and reliability of the research checklist.
- **External validity** measures to what extent the findings in research can be generalised to populations, settings and measure variables (Chetty 2014:4). The

external validity of this study could be transferred to similar context and only be generalised if the same study was repeated in more colleges to ensure data from a variety of settings.

3.5.6.2 Reliability

Reliability is the extent to which the instrument yields the same results on repeated measures (LoBiondo-Wood & Haber 2010:199). De Vos et al (2011:153-156) refer to reliability as the degree of consistency and dependency of the research technique. This means that an instrument is dependable if it yields the same results when used repeatedly over time on the same subjects. An instrument is stable if it yields consistent results when used on two different occasions in a short period of time and is completed by the same people.

The reliability of the study refers to the likelihood that if the same study, when conducted in the same context, would reach the same conclusions. The researcher attempted to improve the chance of replication by:

- Connecting the views of the respondents to a theoretical framework.
- Documenting the steps followed throughout the study, so that other researchers could follow the same steps should they wish to conduct a similar study in another nursing college.

3.5.7 Pilot study or pre-test

The questionnaire was piloted with 10 (2014) third-year nursing students who had already completed their BNS modules (BNS 100 and 200). No sampling was done, after permission was granted to conduct the study. The researcher collected information from the college archive of 5 selected students' records, and then asked a nurse educator to recruit 10 volunteers to participate in the pilot study. A date and time were agreed on and the pilot was conducted.

The respondents were given the information letter and could ask any questions for clarity. The respondents then signed the consent forms.

The questionnaire was checked to assess whether all the questions were answered, and the collected data was forwarded to the researcher's supervisor and the scientific review committee. Changes were then made to the questionnaire according to the feedback received.

3.6 ETHICAL CONSIDERATIONS

Ethics deals with matters of right and wrong. Ethical considerations are essential to any research involving human subjects in order to protect their rights (Polit & Beck 2012:152). Human research should be intended to produce benefits for participants themselves or for other individuals or society as a whole (Polit & Beck 2012:152). Accordingly, the researcher adhered to the ethical principles required in research stipulated in the Nuremberg Code and obtained permission to conduct the study, and ensured the participants' voluntary participation, privacy and confidentiality, and freedom from harm and discomfort (Burns & Grove 2009:185; Bless et al 2014:29).

3.6.1 Permission

Permission to conduct the study was requested from and granted by the Ministry of Health South Africa (see Annexures B and C). The Research and Ethics Committee of the Department of Health Studies, Unisa, also granted permission subsequent to the review and approval of the questionnaire (see Annexure A).

3.6.2 Informed consent

Informed consent is the ethical principle of voluntary participation and protecting the participants from harm (Brink et al 2010:35). Informing is the transmission of essential ideas and content from the researcher to the participants (Burns & Grove 2009:193).

The purpose of the study was explained to the respondents and they were informed that their participation in the study was voluntary and they were under no obligation to participate. The respondents were informed that they had the right to withdraw from the study at any time during data collection without penalty or discrimination. They could also choose not to participate by simply not completing the questionnaire.

3.6.3 Privacy, anonymity and confidentiality

Privacy is the right of individuals to determine the time, extent, and general circumstances under which personal information will be shared or withheld from others (Burns & Grove 2009:186). On the basis of the right of privacy, the respondents had the right to anonymity and to assume the data collected would be kept confidential. Complete anonymity exists if even the researcher cannot link subjects' identity with their individual responses (Burns & Grove 2009:188).

The questionnaire was designed to achieve and preserve respondent anonymity by the fact that their names did not appear on the questionnaire. The findings of the completed study could also not be linked to any of the individuals who took part in the study (Polit & Beck 2012:172). In the case of the student records, the data was recorded anonymously on the checklist to ensure that there was no possible link to any of the respondents. A numerical coding system was implemented using an ordinal scale. It was the researcher's responsibility to ensure that the aggregated data from the questionnaires was kept in a locked cabinet with the boxes sealed in the researcher's office, the questionnaires were anonymous. No unauthorised persons were allowed to access the information. The researcher's laptop was used to capture the data and no any other person had access to the password.

3.6.4 Principle of beneficence and non-maleficence

Beneficence imposes a duty on researchers to attend to the welfare of participants, minimise harm and maximise benefits. Human research should be intended to produce benefits for participants themselves or for other individuals or society as a whole (Polit & Beck 2012:152). In this study, the researcher ensured that the respondents were able to make informed decisions by providing them with the relevant information. The benefits for the respondents were that they were able to give inputs and make a contribution for future students to benefit from the recommendations for possible prerequisites for entry into a nursing programme.

The researcher ensured that all the respondents had an equal chance to participate in the study. Respondents were guaranteed safety measures as no medical interventions

were used during data collection. No adverse effects were anticipated and the results of the study will be available for their access.

3.7 CONCLUSION

This chapter described the research design and methodology, including the setting, population, data collection and analysis. Data was collected by means of a checklist and a structured questionnaire, and the steps taken to ensure reliability and validity as well as the ethical considerations were described.

Chapter 4 presents the data analysis and interpretation.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION, AND FINDINGS

4.1 INTRODUCTION

This chapter discusses the data analysis and interpretation, and the findings.

The purpose of the study was to identify and describe whether passing Grade 12 Biology (currently referred to as Life Science) with at least 50% was a factor in basic nursing students' successful completion of the BNS 100 module in their first year. The findings might be used to recommend Life Science as a prerequisite in student recruitment and entry into a nursing programme.

To achieve the aim, the objectives of the study were to:

- Describe the performance of students in Biological and Natural Science who passed Grade 12 Life Science with at least 50%.
- Describe the performance of students in Biological and Natural Science who did not pass Grade 12 Life Science with at least 50%.
- Describe second-year nursing students' perception of the effect of Grade 12 Life Science on their performance in Biological and Natural Science, as they had already completed BNS 100 and were able to reflect on the module.
- Make recommendations pertaining to specific prerequisites in the selection criteria for entry into the nursing programme.

The researcher chose a descriptive quantitative research design for the study (Brink et al 2010:102).

Data collection is the precise, systematic gathering of information relevant to the purpose or objectives of a study (De Vos et al 2011:151). The researcher collected quantitative data on the BNS100 students' performance in and perception of this module by means of a checklist (students' files) and a questionnaire (students' perceptions), respectively. Data was collected from 193 files of first-year basic nursing

students registered for the BNS100 module in 2014 and 147 second-year nursing students registered for BNS 200 in 2015. The reason was that BNS 200 students had experienced the first-year module (BNS 100) and would have an opinion on whether Grade 12 Life Science had had an effect on or was a factor in their academic performance in BNS 100.

4.2 DATA MANAGEMENT AND ANALYSIS

Data analysis refers to the systematic organisation and synthesis of research data and the testing of research hypotheses using those data (LoBiondo-Wood & Haber 2010:309; Polit & Beck 2012:215). The process involves reducing collected data to a manageable size, developing summaries, identifying patterns and applying statistical techniques. The respondents' academic performance in BNS100 and Grade 12 Life Science (Biology) scores were described to analyse prior knowledge as a factor in BNS100. The second-year respondents' perceptions of their experience in studying the BNS 100 module were described.

The researcher worked together with the statistician who analysed the data, using Stata 14. Descriptive statistics using frequencies were used to describe the data, where the data obtained demonstrated possible associations; the Chi-square test was used to measure associations. The associations between academic achievement in BNS100 and English language proficiency; academic achievement in BNS100 and Grade 12 Life Science results, as well as between English language proficiency and Grade 12 Life Science and the academic achievement in BNS100 were measured. The 95% level of confidence (95% CI) and a probability of $p < 0.05$ were used to define the level of significance. The results were presented in graphs and tables.

In the discussion of the results the following apply:

N: Capital "N" represents the number of the row meaning the total number of records or questionnaires.

n: Lower case "n" represents the number of files or questionnaires included, thus excluding files or questionnaires where information was missing or a question not answered.

F: Capital “F” represents the frequency.

f: Lower case “f” represents the percentage from “F” or “n” where applicable.

4.3 CHECKLIST DATA

The data collected from a total of 193 first-year basic nursing students’ files for the academic year 2014 registered for BNS100 were analysed. The data required on the checklist (see Annexure F) was captured from the files.

4.3.1 Respondents’ demographic data (N=193)

The respondents’ demographic data included age and gender.

4.3.1.1 Age

The respondents were aged between 18 and 34+. Table 4.1 indicates the respondents’ age distribution.

Table 4.1 BNS100 respondents’ age (N=193)

Age	F	Percentage
18-25	89	46,11
26-33	60	31,09
34 and older	44	22,80
Total	193	100,00

Of the 193 respondents, 89 (f=46,11%) were 18-25 years old; 60 (f=31,09%) were 26-33 years old, and 44 (f=22,80%) were 34 years and older. According to the Department of Education (2011b:5), the majority of tertiary students were between 25 and 34 years of age. Dale (2010:2) found that the average age of first-year students in HEIs ranged from late teens to early twenties (19-23 years old).

The respondents who obtained a minimum of 50% for Grade 12 Life Science were regarded as students who had prior knowledge which could be useful in the BNS100 module. Those who did not study Grade 12 Life Science and those who obtained 49%

and less in Grade 12 Life Science were grouped together as not having prior knowledge. Table 4.2 presents the respondents' age and performance in Grade 12 Life Science

Table 4.2 Respondents' age and prior knowledge

Grade 12 Life Science as prior knowledge	18-25 years		26-33 years		34 years and older		Total
	Freq	%	Freq	%	Freq	%	
Prior knowledge	60	77,92	16	20,78	1	1,30	77
No prior knowledge	29	25,00	44	37,93	43	37,07	16
Total	89		60		44		93

The findings revealed that of the BNS100 respondents, 60 (f=77,92%) aged 18-25, 16 (f=20,78%) aged 26-33, and only 1 (f=1,3%) aged 34 and older had prior learning knowledge.

Of the 193 respondents, 77 (f=39,89%) had prior learning knowledge compared to 116 (f= 60,11%) who did not.

4.3.1.2 Gender

Table 4.3 indicates the respondents' gender.

Table 4.3 Respondents' gender

Gender	F	Percentage
Female	167	86,53
Male	26	13,47
Total	193	100,00

Of the 193 respondents, 167 (f=86,53%) were from females and 26 (f=13,47%) were males. The gender distribution reflected a similar pattern that of students in training in Gauteng Province where 3,896 (f=80%) were females and 974 (f=20%) were males (South African Nursing Council Statistics 2014d).

4.3.2 Respondents' BNS 100 achievement and prior knowledge

Of the 193 respondents, 77 had a background knowledge of Grade 12 Life Science, and 62 (f=80,5%) passed the examination while 15 (f=19,5%) failed. Of the respondents, 116 had no prior knowledge of Grade 12 Life Science) and 68 (f=58,6%) passed and 48 (f=41,4%) failed (see table 4.4).

Table 4.4 Respondents' BNS100 academic achievement and prior knowledge

Grade 12 Life Science	Pass BNS 100		Failed BNS 100		Total	
	Freq	%	Freq	%	Freq	%
Prior knowledge	62	80,5	15	19,5	77	100
No prior knowledge	68	58,6	48	41,4	116	100
Total	130	67,3	63	32,7	193	100

The data demonstrated a possible association between academic achievement in BNS100 and background knowledge by having passed Grade 12 Life Science with $\geq 50\%$. Respondents with prior knowledge had a significantly greater chance of passing BNS100 (see table 4.5). Fisher's exact measured the association at = 0.000 Significance.

Table 4.5 Fisher's exact for prior knowledge

Category	Key	Failed BNS	Passed BNS	Total
Life Science ≥ 50	Frequency	15.00	62.00	77.0
	Row %	19.50	80.50	100.0
	Column Percent	18.10	56.40	39.90
Life Science ≤ 49	Frequency	68.00	48.00	116.0
	Row %	58.60	41.40	100.0
	Column %	80.26	48.15	60.1
	Total	83.00	110.00	193.0

Pearson chi2 (1) = 28.9255 Pr = 0.000
 Likelihood-ratio chi2 (1) = 30.4807 Pr = 0.000
 Cramér's V = 0.3871
 Gamma = 0.7083 ASE = 0.086
 Kendall's tau-b = 0.3871 ASE = 0.063
 Fisher's exact = 0.000
 1-Sided Fisher's exact = 0.000

These findings support the cognitive theory of reception which holds that new information should be consistent with prior learning therefore prior knowledge can contribute to improved academic performance (Aliakbari et al 2015:5).

4.3.3 Language proficiency and BNS100

Language proficiency has a positive influence on students' academic performance (Bharuthram 2012:205, 210 & Sadeghi et al 2013:2316).

The findings revealed that of the 153 (N=193) respondents who passed English in Grade 12 with $\geq 50\%$, 100 (f=65,3%) passed the BNS100 examination; of the 24 who passed English with 40-49%, only 1 (f=4, 1%) passed BNS100, and all the respondents who obtained 39% and less in Grade 12 English failed BNS100. These findings support Maher (2011:2) who cites Van Dyk, Zybrands, Cillie and Coetzee (2009) that academic literacy, which includes reading, writing, listening and speaking, was the main reason for success or lack of academic success in HEIs. Table 4.6 indicates the respondents' symbol obtained in Grade 12 English and academic performance in BNS100.

Table 4.6 Respondents' English language proficiency and academic performance in BNS100

Grade 12 English language	Passed BNS100		Failed BNS100		Total	
	Freq	%	Freq	%	Freq	%
Obtained $\geq 50\%$	100	65,3	53	34,7	153	100,0
Obtained $\geq 40-49\%$	1	4,1	23	95,9	24	100,0
Obtained $\geq 30-39\%$	0	0,0	12	100,0	12	100,0
Obtained $\leq 29\%$	0	0,0	4	100,0	4	100,0
Total	101	52,3	92	47,7	193	100,0

Academic performance and success is closely linked to language proficiency. Writing, reading and comprehension competency in the language of instruction can influence academic performance (Kola 2014:278).

In order to analyse second-year students' perceptions of the BNS100 module, questionnaires were distributed to 169 second-year student nurses. On the day of data

collection, 18 (f=9,62%) students were absent, and 147 (f=78,6%) completed questionnaires were returned and captured.

It should be noted that the analysis could only be partially linked to the checklist findings as the questionnaires were anonymous, therefore, no questionnaire could be matched with a specific checklist completed from a student file.

4.4 QUESTIONNAIRE DATA

The completed questionnaires included a combination of 25 open-ended and closed questions, which covered demographic data and academic achievement and performance. Data was captured on Excel and Stata 14 program used for analysis. For open-ended questions, data was coded for qualitative analysis. Prior to commencing the analysis, the data was cross-checked by the biostatistician to ensure accuracy

4.4.1 Respondents' demographic data (N=147)

The respondents' demographic data covered age, gender, marital status, home language, study environment and accommodation.

4.4.1.1 Age (N=147)

The respondents were categorised according to age groups, ranging from 18 to 34 years and older. Of the respondents, 40 (f=27%) were aged 18-21; 39 (f=26%) were 22-25; 23 (f=16%) were 26-29; 10 (f=7%) were 30-33, and 35 (f=24%) were 34 and older. Table 4.7 presents the respondents' ages.

Table 4.7 Respondents' age (N=147)

Age	Freq	Percentage
18-21	40	27
22-25	39	26
26-29	23	16
30-33	10	7
34+	35	24
Total	147	100

4.4.1.2 Respondents' marital status (n=141)

The findings revealed that of the respondents, 99 (f=70%) were not married; 29 (f=21%) were married; 9 (f=6%) were cohabiting; 3 (f=2%) were divorced, and 1 (f=1%) was separated. The percentage of married respondents is consistent with the general trend in the South African population where the 2011 census revealed that 43,7% were not married and 36,7% were married (South African Statistics 2012). Table 4.8 illustrates the respondents' marital status.

Table 4.8 Respondents' marital status (n=141)

Marital status	Freq	Percentage
Not married	99	70
Married	29	21
Cohabitation	9	6
Divorced	3	2
Separated	1	1
Total	141	100

Abou-Elhamed, Al-Wadaani and Almulhim (2014:568) found that marriage in itself does not affect the academic performance in HEIs, but it is largely dependent on the individuals involved.

4.4.2 Respondents' home language (n=146)

The data revealed that the majority of the respondents (F=143; f=98%) spoke African languages whereas the medium of instruction in the college is English.

Of the respondents, 94 (f=64,3%) spoke Tswana; 26 (f=17,8%) spoke Nguni; 20 (f=13,7%) spoke Tsonga/Venda; 3 (f=2,1%) spoke Afrikaans, and 3 (f=2,1%) spoke English. Thus only 3 (f=2,1%) of the respondents spoke English at home, which is the language of instruction in the college as well as many HEIs in South Africa. Significantly, of the 143 respondents did not speak English at home, 100 (f=65,3%) who obtained $\geq 50\%$ for English passed BNS100. All but one of the respondents who obtained $\leq 49\%$ for English failed BNS100 (see table 4.6). Figure 4.1 illustrates the respondents' home language.

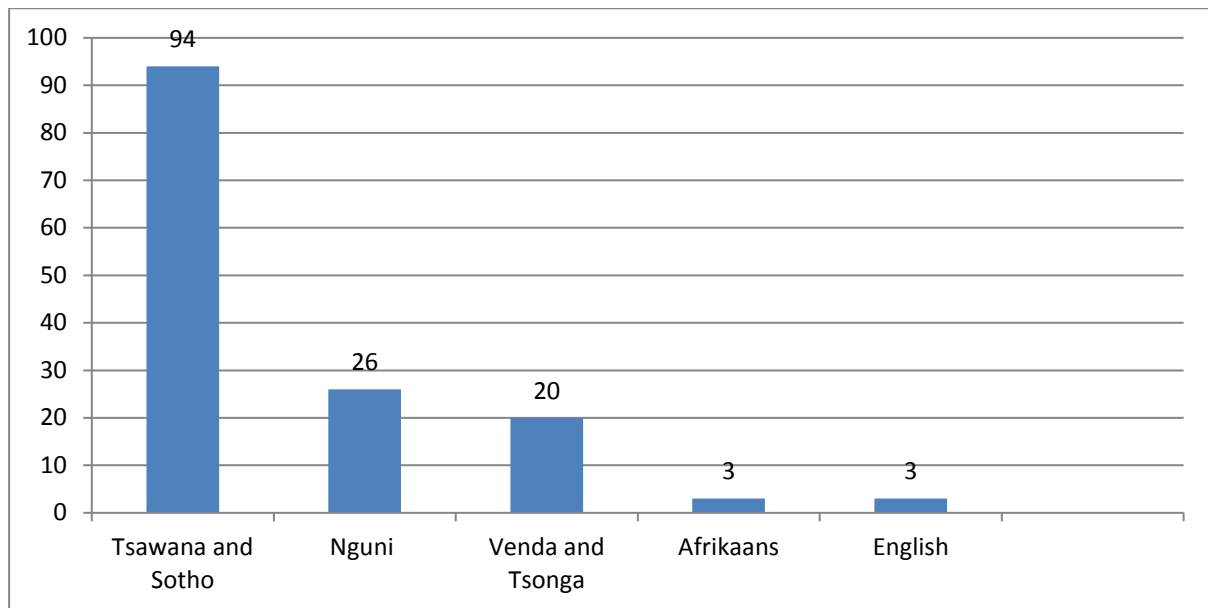


Figure 4.1 Respondents' home language (n=146)

4.4.3 Study environment (n=145)

Lopez and Wodtke (2010:506) examined college residence and academic performance and found that students who stayed on campus normally had significantly higher academic scores than those living off campus. A quiet environment with minimal distractions is an ideal study environment whether at home or in college (Markman 2012:1). Students need a quiet place where they are not disturbed in order to concentrate (Ramsey & Witter 2010:2).

Of the respondents, 82 (f=56%) stay in the college residence; 27 (f=19%) in their own homes; 20 (f=14%) in their parents' homes; 11 (f= 8%) in rented flats, and 5 (f= 3%) in rented rooms as tenants in private residential areas. Of the respondents, 67% were not married and stayed in college residence. Table 4.9 indicates the respondents' accommodation.

Table 4.9 Respondents' accommodation while in training (n=145)

Accommodation while in training	Freq	Percentage
College residence	82	56
Own room	27	19
Parents' home	20	14
Private room	11	8
Renting a room	5	3
Total	145	100

The data also revealed the respondents' preferred place of study. Of the respondents, 33 (f=40%) studied in their rooms in the college residence; 25 (f=30%) studied in the library; 17 (f=21%) studied in their own flats, and 7 (f=9%) studied in a room in their parents' homes.

The findings confirm that the respondents preferred a room in the college residence and the library as place to study (see table 4.10).

Table 4.10 Place of study (n=82)

Place of study	Freq	Percentage
Room in the college residence	33	40
Library	25	30
Room in my own flat/home	17	21
Room in my parents' home	7	9
Total	82	100

The data further assessed whether the respondents considered that their study environment (place of study) influenced their academic performance in BNS100 (see table 4.11).

Table 4.11 Respondents' perceptions of place of study influence on performance in BNS100 (n=146)

Whether place of study influenced performance in BNS	Freq	Percentage
No	82	56,2
Yes	64	43,8
Total	146	100,0

Of the respondents, 82 (f=56, 2%) indicated that their place of study did not influence their academic performance, and 64 (f=43, 8%) indicated that the place of study did influence their academic performance in BNS100.

The respondents were asked to explain how the environment impacted on their performance. Only 56 respondents explained how their environment impacted or did not impact on their performance. This open-ended question was open coded and the themes and categories identified to describe the reasons for the influence (see table 4.12).

Table 4.12 How respondents' place of study influenced their academic performance in BNS100 (n=56)

Themes	Category	Responses
Positively influenced	• Discussion groups	19
	• Quiet environment in the residence allowed concentration	10
	• Safe environment in residence allow concentration	8
Negatively influenced	• Disruptive environment	19

The respondents indicated that discussion groups were good and assisted them to understand the study content and therefore positively influenced their performance. They added that it was easy to form a discussion group because they all stayed in the same place. Moreover, they achieved social acceptance from each other which also helped them to adapt to the university culture. Yu, Tian and Chi-Wai Kwok (2010:1494) found that online social networking groups allowed groups to virtually get together which also boosted learning.

The respondents indicated that a quiet and safe environment positively influenced their performance because it facilitated concentration. They found it easier to study in a quiet and safe environment such as a room in the college residence and library. This enabled them to concentrate and understand the content that they were studying.

Some respondents indicated that their place of study negatively influenced their performance because it was disruptive. They stated that it was difficult to concentrate because it was noisy and they were distracted.

The findings thus indicated that of the respondents, 70% studied in a room in the college residence and the library, and 66,1% indicated that group discussions and the quiet and safe environment positively influenced their academic performance in BNS100. The study therefore concluded that the library and college residence were experienced as an ideal environment for studying.

4.4.4 Prior knowledge (N=147)

The respondents were asked to indicate their achievements in Grade 12 Life Science (see table 4.13).

Table 4.13 Respondents' Grade 12 symbol in Life Science (N=147)

Symbol	F	Percentage
A/ L7 (80-100%)	3	2,0
B/ L6 (70-79%)	16	11,0
C/ L5 (60-69%)	36	24,5
D/ L4 (50-59%)	32	21,7
N	87	59,2
E/ L3 (40-49%)	14	9,5
F/ L2 (30-39%)	6	4,1
Did not study Life Science in Grade 12	40	27,2
		40,8
Total	147	100

The findings revealed that of the respondents, 87 (f=59,2%) had a background knowledge of Grade 12 Life Science and 60 (f=40,8%) did not.

The respondents were asked whether passing Grade 12 Life Science did or did not influence their academic performance in BNS100. However, respondents, with marks as low as between 20 and 30% regarded themselves as having prior knowledge, therefore the operational definition of a minimum of $\geq 50\%$ as an indication of having prior knowledge did not apply to their personal opinions. Their responses were analysed and interpreted as discussed below.

Only 107 respondents answered this question and their responses are reflected in table 4.14.

Table 4.14 Grade 12 Life Science influenced academic performance in BNS100 (n=107)

Perceptions of whether passing Life Science influenced academic performance in BNS	F	Percentage
Yes	50	49,11
No	57	50,89
Total	107	100,00

The results indicated that of the respondents, 50 (f=49,11%) were of the opinion that their background knowledge of Grade 12 Life Science influenced their academic performance in BNS100 and 57 (f=50, 89%) were of the opinion that it did not.

The results indicated further that the respondents had different perceptions of whether their successful achievement in BNS100 module was influenced positively by their background knowledge of Grade 12 Life Science. Of the 50 respondents who indicated that their background knowledge of Grade 12 Life Science influenced their academic performance in BNS100, 43 (f= 86,0%) obtained $\geq 50\%$ in Grade 12 Life Science, and only 7 (f=14,0%) obtained $\leq 49\%$. This implied that the respondents with prior knowledge, according to the operational definition, perceived prior knowledge to be beneficial to their success

Of the 57 respondents who indicated that their background knowledge of Grade 12 Life Science did not influence their academic performance in BNS100, 43 (f=75, 44%) passed Life Science with $\geq 50\%$ and 14 (f=24,56%) obtained $\leq 49\%$.

Since the questionnaire did not include the first-year BNS100 results, the respondents' perceptions could not directly be linked specifically to their achievement in BNS100. However, based on the findings from the checklist (see table 4.4) 54 (f=46,6%) of the respondents who did not have a background knowledge failed BNS 100. Thus, contradictory to the respondents' perceptions, their English language proficiency, as indicated in the checklist findings played a role in passing BNS100 without having prior knowledge (see table 4.6).

Only 25 respondents answered the open-ended question and explained (gave reasons) why they thought Grade 12 Life Science made a difference in their academic achievement in BNS100. Of these respondents, 23 maintained that their background knowledge was beneficial as the BNS100 content was similar to the Grade 12 Life Science, while 2 maintained that it did not influence their academic performance because BNS100 and Grade 12 Life Science were not similar.

The respondents who had not studied Grade 12 Life Science were asked whether they believed that not having prior knowledge (Grade 12 Life Science) was a factor that could have influenced their performance in BNS100. Of the 60 respondents who did not have prior knowledge, 40 answered the question (see table 4.15).

Table 4.15 Respondents' perceptions of the influence of no prior knowledge on their performance in BNS100 (n=40)

Prior knowledge influenced BNS100 performance	F	Percentage
No	24	60
Yes	16	40
N	40	100

Of the respondents who did not study Grade 12 Life Science, 24 (f=60%) perceived their lack of prior knowledge as not being a factor in their performance in BNS100, while 16 (F=16; f=40%) indicated that the absence of prior knowledge had a negative impact on their performance in BNS100. What was of concern was that the respondents' perceptions did not always reflect the actual results of all those who did not have prior knowledge.

Data from the first-year files indicated that Grade 12 Life Science (prior knowledge) could be significantly associated with the pass rate for BNS100. In this context, the respondents' perceptions did not correlate with the evidence of the marks received in their first-year BNS100 module.

The respondents were asked if Life Science should be a prerequisite for admission into basic nursing programme (see table 4.16).

Table 4.16 Respondents' view of Life Science as a prerequisite (n=65)

Life Science as prerequisite	F	Percentage
Yes	39	60
No	26	40
Total	65	100

Of the 147 respondents, only 65 answered this question: 39 (f=60%) indicated that Grade 12 Life Science must be a prerequisite, while 26 (f=40%) did not. Learning is an inductive process, starting from a primary understanding of general concepts and continuing to understand the specific details, and this has a close relationship with the students' previous knowledge and current cognitive structure (Bless et al 2014:7).

The respondents were asked to indicate whether they would have valued Grade 12 Life Science as a prerequisite. Of the respondents, 39 (f=60%) recommended that Life Science should be a prerequisite for entry into the nursing programme, contradictory to their previous opinion that prior knowledge did not influence their results in BNS 100.

Although only 65 respondents answered the question of whether Grade 12 Life Science should be recommended as a prerequisite for a basic nursing programme or not, 112 out of the 147 respondents provided reasons for the recommendations to include Life Science as a prerequisite or not. This open-ended question was open coded and three themes and four categories were identified to describe their reasons (see table 4.17).

Table 4.17 Respondents' reasons for recommendation to include Life Science as a prerequisite or not (n=112)

Themes	Category	Responses
Life Science as a prerequisite	<ul style="list-style-type: none"> Life Science builds a foundation for BNS 	86
Life Science not needed as a prerequisite	<ul style="list-style-type: none"> Students can do well without Life Science knowledge BNS not necessary for nursing programme 	16 6
The standard of teaching is too high	<ul style="list-style-type: none"> Life Science would not have made a difference 	4

Of the respondents, 86 indicated that background knowledge of Life Science was a good foundation for BNS100 and should be a prerequisite and 16 indicated that students did not need Life Science as a prerequisite. Of grave concern was that 6 respondents, in a profession like nursing, felt that BNS100 was not necessary in the nursing programme. These respondents did not see the importance of Life Science in a profession where caring for humans is essential. Another 4 respondents perceived the standard of teaching BNS100 as too high for a first-year nurse and were of the opinion that Life Science would not have made a difference.

4.4.5 Respondents' perceptions of contributing factors to good or bad performance in BNS100

The respondents were asked to indicate what contributed to their good or poor performance in BNS100 (see tables 4.18 and 4.19). This open-ended question was open coded and themes and categories identified.

Table 4.18 presents respondents' perceptions of factors that contributed to their poor performance.

Table 4.18 Respondents' perceptions of factors in poor performance in BNS100

Themes	Category	Responses
Time management	• Lack of time management skills	30
Study methods	• Poor study methods	22
Personal problems	• Social problems • Class attendance	19 6
Lack of background knowledge	• Life Science (pre requisite)	11
Education	• Lack of good BNS educators	2

Of the respondents, 30 indicated that lack of time management skills contributed to their poor performance in BNS100; 22 indicated poor study methods; 19 indicated social problems; 11 indicated their lack of background knowledge; 6 indicated poor class attendance, and 2 indicated lack of good BNS educators. Poor study methods are of concern since lack of good study methods affects not only BNS100 but all training and adequate student throughput which, in turn, impact negatively on government (state) funding.

The respondents were asked to indicate the factors that contributed to their good achievement in BNS100. This open-ended question was open coded and three themes and 6 categories were identified to describe their perceptions (see table 4.19).

Table 4.19 Respondents' perceptions of factors in good performance in BNS100

Themes	Category	Responses
Work ethics	• Study hard	32
BNS classes	• Attend class regularly • Pay attention in class • Consult the educator	21 5 14
Support strategies	• Attend peer tutoring classes • Time management	11 12

Of the respondents, 95 indicated the factors in their good performance in BNS100. Of the respondents, 32 indicated good work ethics which led them to study hard; 40 indicated regular class attendance, paying attention in class and consulting the BNS educators and 23 indicated support strategies, including attending peer tutoring classes and good time management.

4.4.6 Support strategies

The respondents were asked to indicate resources that they perceived would support them in their studies, such as a simulation laboratory, computer laboratory and the library.

4.4.6.1 *Simulation laboratory*

The respondents were asked to indicate the value of a simulation laboratory as a way of supporting them to obtain the required knowledge and skills (see table 4.20).

Table 4.20 Respondents' rating of a simulation laboratory (n=146)

Rate the value of simulation laboratory	F	Percentage
Highly recommended	68	46,5
Recommended	43	29,5
Not sure	27	18,5
Not recommended	8	5,5
Total	146	100,0

Of 146 respondents, 68 highly recommended a simulation laboratory; 43 recommended it; 27 were not sure, and 8 did not recommend it. Most of the respondents recommended a simulation laboratory to improve academic achievement.

The respondents were asked to justify why they rated a simulation laboratory, and 135 responses were received. The responses were open coded and the themes and categories identified (see table 4.21).

Table 4.21 Respondents' reasons for a simulation laboratory (n=135)

Themes	Category	Responses
Positive aspects	• Helps to understand the content	89
	• Prepares the students for the real hospital environment	11
Negative aspects	• Difficult to relate BNS content to the simulation laboratory activities	22
	• Time consuming	12
	• Lack of a facilitator	1

Of the respondents, 100 indicated positive aspects of having a simulation laboratory as assisting students to understand the content as well as preparing them for a real hospital environment, and 35 listed negative aspects including the difficulty of relating activities in the laboratory to the BNS content; it was a time-consuming activity, and there was not always a facilitator to attend to students queries. Valizadeh et al (2013:158) and Shawwa et al (2015:66) found simulation laboratories a good environment that enhanced understanding.

4.4.6.2 Computer programs

The respondents were asked to rate computer programs as supports to improve academic performance in BNS100 (see table 4.22).

Table 4.22 Respondents' computer programs ratings (n=142)

Rate the value of computer programs	F	Percentage
Highly recommended	67	47,2
Recommended	45	31,7
Not sure	25	17,5
Not recommended	5	3,5
N	142	100,0

Of the 142 respondents, 67 highly recommended and 45 recommended (F=112) computer programs; 25 were unsure, and 5 did not recommend them. Most of the respondents (79%) considered that computer programs would assist in improving the throughput rate.

The respondents were asked to explain why they recommended computer programs. This open-ended question was open coded and two themes and 4 categories were identified (see table 4.23).

Table 4.23 Respondents' reasons for computer programs

Themes	Category	Responses
Computer programs are needed	• Provide visual clarification	104
	• To be available in vernacular	1
Computer programs not needed	• Not enough time	15
	• Not necessary	10

Of the respondents, 105 indicated that computer programs provide visual clarification, with 1 indicating they should also be available in vernacular; 35 indicated that computer programs were not needed and there was not enough time to use them.

In West Lafayette, Sharon et al (2012:187) found that biology and nursing students indicated that a Web-based information literacy tutorial helped students to understand modules better and easily.

4.4.6.3 Library

The respondents were asked to indicate whether the library had adequate study material to help them obtain the required knowledge (see table 4.24).

Table 4.24 Respondents' perceptions of library study material adequate (n=142)

Library study material adequate	F	Percentage
Yes	106	74,6
No	36	25,4
Total	142	100,0

Of the respondents, 142 indicated that the library is important; 106 indicated that the library had adequate study material, and 36 indicated that the study material in the library was not adequate.

Cox and Jantti (2012:3) point out that there is an association between a well-resourced library and students' performance. Cox and Jantti (2012:5) emphasise further that borrowing books from a library does not translate into learning, as there are other factors of equal importance to students' academic success

4.4.6.4 Respondents' perceptions of the prescribed study material

The respondents were asked to indicate the adequacy of their prescribed study material (see table 4.25).

Table 4.25 Respondents' perceptions of the prescribed study material (n=143)

Prescribed study material adequate	F	Percentage
Yes	123	86
No	20	14
Total	143	100

Prescribed study material plays a very important role in HEIs to ensure that students perform well in their studies (Owusu-Accheaw & Larson 2014:1). Out of 143 respondents, 123 (f=86%) indicated that the prescribed study material was adequate and 20 (f=14%) indicated that it was not adequate. According to the Publishers' Association of Southern Africa Academic Subcommittee (2014:5), a good relationship between academics and publishers allows an opportunity to identify and meet the needs of students in relation to education and training, especially on the quality of the prescribed study material in order to enhance the throughput rates in HEIs.

The respondents were asked why they thought the prescribed study material was not adequate. The responses were open coded and 4 themes and 4 categories were identified (see table 4.26).

Table 4.26 Respondents' reasons why prescribed study material not adequate (n=20)

Themes	Category	Responses
Audio-visuals	• Students need to be provided with more audio-visuals	10
Handouts	• Additional aspects needed	2
Prescribed books	• The available prescribed material is very limited	6
Terminology	• The prescribed books had too many terms	2

Of the 20 respondents who replied, 10 indicated the need for audio-visuals to improve their academic performance in BNS100; 2 indicated handouts as an additional aspect to improve academic performance; 6 indicated that the available prescribed books had limited information, and 2 indicated that the terminology was too difficult to understand. This appears to be a common phenomenon and therefore Bailey (2015:2) maintains that definitions of central concepts must be clear, diagrams must be provided and there must be frequent use and repetition of Biology and relevant terms.

4.4.7 Respondents' views of competency of BNS educators (n=144)

The respondents were asked to rate the BNS educators' level of competency (see table 4.27).

Table 4.27 Respondents' BNS educators' competency (n=144)

BNS educators' level of knowledge	F	Percentage
Excellent	92	63,9
Good	38	26,4
Average	10	6,9
Poor	4	2,8
N	144	100,0

Of the 144 respondents, 92 indicated that their BNS 100 educators were excellent and 38 indicated that they were good ($F=130$; $f=90\%$); 10 ($f=6,9\%$) indicated that they were average, and 4 ($f=2,8\%$) indicated that they did not have adequate knowledge of the subject. Competent educators are needed in HEIs to enhance the throughput rates and support the students in their education (Komprirovic & Zivkovic 2012:4).

The respondents were asked to justify their ratings. The responses were open coded and 4 themes and 4 categories were identified (see table 4.28).

Table 4.28 BNS educators' competency in the subject (n=123)

Themes	Category	Responses
Competent educators	• BNS educators are knowledgeable	112
Good relationship	• Good relationships with students	2
Supportive	• They always support them	3
Not competent enough	• Old teaching strategies	6

Of the 123 respondents, 117 (F=112 +2+3) indicated that the BNS educators were competent in terms of their knowledge of the subject, had a good relationship with their students and were supportive; while 6 indicated that they were incompetent and some of the teaching strategies they used were old and ineffective.

In HEIs different teaching strategies are used during education and training. The Multiple Intelligent Approach (MIA) is a strategy in which different approaches, like music, role plays, poems and others are used to present the content (Gardner 2001:20). Due to the different age groups of the students in class, educators need to be flexible, in order to accommodate all the students (Stacey 2015:1). Teaching strategies have a positive impact on the academic success of the students and always need to be applied (Cox & Jantti 2012:5).

4.4.8 Respondents' suggestions to improve student throughput rates (n=67)

The respondents were asked to make suggestions on how the throughput rates of students could be improved. Six themes and 10 categories were identified in an attempt to simplify the responses into manageable data (see table 4.29).

Table 4.29 Suggestions (n=67)

Themes	Category	Responses
BNS100 module periods	• BNS periods should be increased	15
	• Increase class attendance	5
Teaching standard	• The standard of teaching should be reduced	10
Supportive measures for students' learning	• WIFI installed in the college campus	9
	• Prerequisite knowledge of BNS must be a requirement for entry into nursing programme	9
	• Extended library open hours	7
	• Enough time allocation for consultation	5
Assessment schedule	• Assessment should be written shortly after the content has been presented	4
BNS module is not necessary in nursing	• BNS should be removed from nursing	3

Of the 67 respondents, 20 (F=15+5) indicated that BNS100 periods were inadequate to allow ample time to comprehend the content therefore BNS100 periods should be increased in order to increase the time of class attendance; 10 indicated that the teaching standard was too high and should be lowered because students struggled to transform from secondary level learning to higher education level. Mbavu (2011: 92) found that most students struggle to transform from secondary level of education into tertiary level when they enter HEIs.

Of the respondents, 30 (F=9+9+7+5) indicated a need for more supportive strategies in their learning and suggested free network availability for academic use within the college campus. The use of the Internet has been found to have a positive effect in teaching and learning and assist in improving students' academic performance (Sampath Kumur & Manjunath 2013:220).

The respondents suggested that Grade 12 Life Science should be a pre-requisite for acceptance to the basic nursing programme as prior knowledge should improve the academic performance in BNS100. Moreover, the respondents suggested that library open hours and time allocated for consultation should be extended as these can improve throughput rates. Cox and Jantti (2012:3) state that there is a correlation between students' library usage and academic achievement thus supporting the notion that using the library can improve academic performance.

Of the respondents, 4 indicated that the assessment schedule should be planned and scheduled to be shortly after the content was delivered in class as that might improve the academic performance in BNS100. It should be noted that these respondents might struggle to recall information during examination, hence it is necessary to give them direction by using visual images, help them to over-learn content and provide them with teacher-prepared handouts prior to class lecturing (Thorne 2009:3). The researcher found it of serious concern that 3 respondents indicated that BNS was not necessary in the nursing profession and should be removed from the curriculum. BNS100 forms the foundation of the basic nursing programme and nursing is the art of human science therefore BNS cannot be removed from the programme (International Council of Nurses 2015:1), Students should be supported and enabled to overcome the challenge of not understanding the BNS module.

4.5 CONCLUSION

This chapter discussed the data analysis and interpretation and the findings. The findings were discussed in relation to the literature review.

It was found that there is a correlation between background knowledge of Grade 12 Life Science and academic performance in BNS100 and that English language proficiency plays a role in learning and understanding BNS100. Life Science is a factor associated with academic achievement in BNS100. English literacy is of grave concern since a very low 30% in English language in Grade 12 is required for entry into the nursing profession.

Chapter 5 concludes the study, briefly describes its limitations, and makes recommendations for practice and further research.

CHAPTER 5

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The aim of this study was to describe Grade 12 Biology currently referred to as Life Science as a factor in the successful completion of Biological and Natural Science (BNS100) in basic nursing studies. The intention was to make possible recommendations for selection criteria for the college to enhance the throughput rates of students. The study wished to assess whether a background knowledge of Grade 12 Life Science was a factor in the academic performance of basic nursing students particularly in the BNS100 module.

A checklist was used to capture data from the 2014 first-year BNS100 students' records to obtain demographic data and most importantly their Grade 12 Life Science and English academic achievement as well as BNS100 academic performances.

A questionnaire was used to obtain data from the 2015 second-year basic nursing students' perceptions of prior knowledge of Grade 12 Life Science and their performance in BNS100. The role of the questionnaire was to capture the perceptions of the students who had already passed or failed BNS100. Their responses and achievements as indicated in the first-year files were taken into consideration when making recommendations for this study.

5.2 AGE

The data revealed that 60 (f=67,42%) of the 89 respondents aged 18-25 had prior knowledge of BNS100 (that is, Grade 12 Life Science) and 53 (f=88, 3%) passed the BNS100 examination on the first attempt; 7 (f=11,7%) wrote a supplementary examination and passed. Only 1 respondent aged over 34 years with prior knowledge failed BNS100. Successful performances in the BNS100 module were proportional to prior knowledge of Grade 12 Life Science and inversely proportional to age (see table 4.2). Of concern was that 43 (f=97,73%) of the 44 respondents over 34 years did not

have prior knowledge and only 10 (f=23,2%) passed BNS100. It might be that the older students did not plan to further their studies or planned to enrol in a nursing program and therefore did not choose Biology/Life Science as a subject in Grade 12.

Recommendation

It is recommended that students who apply for nursing programmes, including older students who did not achieve $\geq 50\%$ in Life Science in Grade 12 should enrol for a 6-month introductory or bridging module to BNS100. This will provide them with a background to enable them to write a challenge exam (Recognition of Prior Learning [RPL]). If they pass the challenge exam they can enrol for the nursing program. This might contribute to enhance the throughput rates of students selected and can contribute to more professional nurses for the workforce.

5.3 GENDER

The data revealed that 167 (f=87%) of the 193 respondents were females and 26 (f=13%) were males, which are proportional to the statistics of students in training in the Gauteng Province where 3896 (f=80,0%) female basic nursing students and 974 (f=20,0%) of males (SANC 2014d). Gender had no influence on the academic performance in both Grade 12 Life Science or in the BNS100 examination.

5.4 GRADE 12 LIFE SCIENCE AS PRIOR KNOWLEDGE

According to the cognitive theory of learning, Grade 12 Life Science can be seen as the background knowledge needed for the BNS100 module in the nursing programme and therefore should impact positively on academic performance in BNS100. In this study, 62 (f=80,5%) of the 77 respondents with a background knowledge of Grade 12 Life Science passed the BNS 100 examination and only 15 (f=19,5%) failed. Of the 116 respondents without a background knowledge of Grade 12 Life Science, 68 (f=58,6%) failed the examination (see table 4.4).

Correlational statistics using Fisher's exact test measured this association (background knowledge of Grade 12 Life Science and successful academic achievement in BNS100) as being symptomatically significant at a score of 0.000. It was evident that background

knowledge should be seen as an achievement of at least 50% in Life Science in Grade 12, as was the operational definition of the background knowledge in this study.

Of the respondents (F=16; f=40%) perceived that their lack of background knowledge of Grade 12 Life Science negatively influenced their academic performance in BNS100. The overall finding was that the marks achieved (checklist) as well as the respondents' perception (questionnaires) indicated that background knowledge (Grade 12 Life Science) was a factor in passing BNS100. A significant association of Grade 12 Life Science and academic performance in BNS100 exists when comparing results as well as according to the respondents' perceptions (see tables 4.4. and 4.15, respectively).

Recommendation

It might be needed to revisit the selection criteria of nursing colleges, if the throughput rates within the minimum time required need to be improved and more qualified professional nurses are to be produced for the profession. Candidates that have a higher chance of completing their studies need to be selected. Selection criteria should include Biology (Life Science) as a Grade 12 subject as is the case with the selection criteria for nursing programmes in universities and nursing colleges in other countries worldwide. Prior knowledge of Biology (Life Science) can contribute to passing BNS 100 or similar modules in other institutions. The admission point score (APS) should be at least 30; that is, calculation based on a candidate's achievement in six (6) recognised subjects, by using the National Senior Certificate ratings, i.e. 1-7 scale of achievement (South Africa. DOE 2014b). This study, supported by the cognitive theory of learning, recommends that prior knowledge should be a prerequisite in order to succeed in academic performance (Aliakbari et al 2015:8). As mentioned in section 5.4 (Prior knowledge) an introductory module to provide background knowledge can be implemented to comply with the selection criteria and support students without Grade 12 Life Science.

5.5 LANGUAGE PROFICIENCY

The study found that the respondents, who achieved $\geq 50\%$ in English language in Grade 12 performed better in the BNS100 examination with or without prior knowledge of Grade 12 Life Science. Of the 77 respondents who passed Grade 12 English

language and Life Science with $\geq 50\%$, 62 ($f=80,5\%$) passed BNS100 examination with at least 50% (see table 4.4 and 4.6). This indicates clearly that both language proficiency and prior knowledge positively influenced the respondents' academic performance in BNS100. For 144 ($f=98\%$) of the 146 respondents, English is not their first language (see section 4.4.2) though it is the medium of learning and teaching in most nursing colleges. Despite this fact, the college only required an average English Grade 12 mark of $\geq 30\%$. The findings show that this is detrimental to their success in passing BNS100 and ultimately to succeeding in their nursing studies.

Recommendation

It is recommended that all students who did not achieve $\geq 50\%$ in Grade 12 English language should be supported. Students who did not achieve a mark of at least 50% in Grade 12 English should first write a language proficiency test. If they fail this test (not achieving at least 50%) they should enrol for a compulsory six-month English language module to provide them with language proficiency skills and the ability to re-write the language proficiency test before registering for the nursing programme. This might extend their programme with a year, but should contribute to the overall throughput rates.

5.6 ACCOMMODATION AND STUDY ENVIRONMENT DURING TRAINING

The findings revealed that of the 145 respondents, 82 ($f=56,0\%$) stayed in the college residence (see table 4.9) and 58 ($f=70,0\%$) preferred to study in the college residence and college library (see table 4.10). They indicated that they were able to form discussion groups and concentrate because the environment was safe and quiet.

Of the respondents, 19 attributed their unsuccessful performance in BNS100 module to increased distractions and a failure to concentrate due to their accommodation and study environment (see table 4.12). A quiet environment increases concentration and is associated with successful academic performance (Markman 2012:1; Ramsey & Winter 2010:2).

Recommendation

Given the impact of residence and study environment, it is recommended that first- year students should stay in the residence, except if their family responsibilities do not allow this. It is further recommended that a space in the library or student residence should be made available for students to study to ensure that they have a quiet place conducive to learning available to study if they choose to do so.

5.7 CLASS ATTENDANCE

Of the 74 (n=74, f=27%) respondents who answered the question on class attendance, only 20 indicated that attending BNS100 classes regularly helped them to understand the content and contributed to their successful academic performance in the module. Possibly some did not attend classes regularly and therefore could not answer the question because they did not know whether attending would have benefitted them. This aspect needs to be researched further as it was outside the scope of this study.

Recommendation

The researcher recommends further research on class attendance in this context. Compulsory class attendance to allow entry to the examination and peer tutoring classes for all students who fail tests can be an interim measure in an attempt to improve the throughputs rates.

5.8 BNS EDUCATORS' COMPETENCY

According to 117 of the 123 respondents (f=96,6%) their BNS module educators are hardworking and knowledgeable and both educators and students should work harder to improve the throughput rates (see table 4.28). Successful teaching and learning is the result of effort from both educators and students and educators should be role models for their students (Aliakbari et al 2015:8).

Recommendation

The researcher recommends that educators' qualifications, records and progress in their ongoing professional development, especially in the area of their specialisation, should be kept updated to ensure that they are aware of current developments in their specialisation area (SANC 2015).

5.9 SUPPORT STRATEGIES FOR STUDENTS

The findings revealed that the respondents perceived a simulation laboratory, computer programs and library, and prescribed study material (see table 4.20 to 4.25) as good supportive teaching and learning strategies that contribute to good performance in BNS100. The respondents perceived computer programs and the study material as good teaching aids that enhanced their understanding of BNS100. Simulation laboratories and computer programs are practical and relevant as teaching aids for visual clarification of abstract concepts (Aliakbari et al 2015:8).

Recommendation

Training should be designed and implemented to be compatible with students' thinking and should be practical, visual and abstract (Aliakbari et al 2015:8). It is therefore recommended that **simulation** and **computer laboratories** should be well equipped and accessible to the students to allow ample time to study by using the models and computer programs. The open hours for the **library** should be extended to allow students to access the study material at a time more convenient for them. It is recommended that the college management committee that deals with public funds management should consider seeking funds to address these needs.

5.10 APPROACHES TO SUPPORT STUDENTS' LEARNING

Based on the respondents' suggestions to improve the academic performance in BNS100 and the throughput rates (see table 4.29), the researcher makes the following recommendations for consultation periods, library working hours, and teaching strategies:

Consultation periods

The management of the nursing college under study should consider revising the college regulations in order to accommodate that lessons start at 8:00 am instead of 7:00 am to allow some time for consultation with lecturers.

Library working hours

The management of the nursing college should review the library open hours and consider extending library working hours to open from 07:00-22:00 instead of 07: 00-16:00 during the week and to be open over the weekends from 08:00-20:00. Extended hours would allow time for students to make use of the services available to improve their academic performance in their studies.

Teaching strategies

Multiple intelligence approach (MIA) is the cheapest form of teaching strategy, in which students use poems, music, dramatization or any form of game play to teach one another in a classroom with their educators facilitating the learning process (Gardner 2001:1). Educators should consider using a variety of different teaching strategies to ensure that all age groups are catered for to enhance understanding and improved academic performance in BNS100.

5.11 RECOMMENDATIONS FOR FURTHER RESEARCH

Based on the findings of this study, the researcher recommends that further research be conducted on the following topics:

- An investigation into Grade 12 Life Science and English language proficiency as prerequisites for admission to basic nursing studies in other nursing colleges in other provinces in order to make evidence-based recommendations for the selection criteria for nursing institutions (colleges).
- The role and impact of regular class attendance on the academic achievement of students and throughput rates.

- BNS educators' perceptions of teaching methods and aids to engage students in order to improve understanding and concentration.

5.12 LIMITATIONS

This study was limited to only one public nursing college, thus the findings cannot be generalised to nursing colleges in the rest of the country. However the intention was to obtain relevant evidence of the extent to which prior knowledge of Grade 12 Life Science in a specific institution could impact on the academic performance in a relevant module like BNS100 module in the study context. The researcher added language proficiency in English which also proved to be relevant to performance and should be taken into consideration when the findings are used to support studies for similar contexts.

These findings might therefore support motivations to include English language proficiency and Life Science (Biology) as prerequisites in the selection criteria for nursing programmes in this and other colleges of nursing in South Africa, similar to the current global tendency.

5.13 CONCLUDING REMARKS

Recruitment and selection policies should contribute to the enhancement of throughput rates and decrease the level of student attrition in nursing programmes. Including prerequisites therefore contributes to the success of the students selected, but should also make provision to assist students who do not comply, by enrolling for bridging modules to give them a chance to enter have a better chance of success.

In South Africa prospective candidates who want access to a degree programme in nursing at HEIs have to be in possession of a recognised National Senior Certificate (NSC) and to have achieved $\geq 50\%$ in at least 4 subjects selected from the designated list of NSC subjects (South Africa. DOHE and Training 2010)). This is similar to the requirements of colleges and universities worldwide.

Based on the findings of the study, the researcher recommends that an achievement of at least 50% in Grade 12 Life Science as well as English should be compulsory

prerequisites for entry into a basic nursing programme. For those without these achievements, support programmes prior to entry should be available to enhance their chances of success. This approach might assist to curb the nursing shortage in the South African context.

50% is not adequate or sufficient. A pass mark of 50% means that students have only got 50% worth of knowledge of that year/level of the subject and that is the basis or foundation on which you will build your growth, understanding, etc for the following year. In the case of going from high school (secondary) education level to university/college (tertiary) level that is a pretty weak foundation. The researcher found with teaching (and lecturing) that if one could link things to the pupil's/student's world students were halfway there. Not an easy achievement and it also means you have to love and know your subject and be able to convey and instil enthusiasm and respect.

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ANNEXURES

ANNEXURE A

Ethical Clearance Certificate, Department of Health Studies, UNISA



UNIVERSITY OF SOUTH AFRICA
Health Studies Higher Degrees Committee
College of Human Sciences
ETHICAL CLEARANCE CERTIFICATE

REC-012714-039

HS HDC/332/2014

Date: 27 August 2014 Student No: 3086-483-6

Project Title: Grade 12 Biology: A factor in the academic achievement in Biological Natural Science in basic nursing studies.

Researcher: Onica Mankebe Ndwambi

Degree: MA in Nursing Science Code: MPCHS94

Supervisor: Dr JC Lubbe
Qualification: PhD
Joint Supervisor: Prof L Roets

DECISION OF COMMITTEE

Approved



Conditionally Approved



Prof L Roets

CHAIRPERSON: HEALTH STUDIES HIGHER DEGREES COMMITTEE

Prof MM Moleki

ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

ANNEXURE B

Letter to the Gauteng Department of Health to obtain permission to do the study

REQUEST TO CONDUCT STUDY AT SG LOURENS NURSING COLLEGE

P.O. BOX 11135

Suiderburg

0055

June 2014

SG Lourens Nursing College

The Principal

Private bag x755

Pretoria

0001

29 June 2014

RE: Permission to conduct Research study. The title of my study is: Grade 12 Life Science: A factor in the academic achievement in Biological and Natural Science.

Dear Sir/Madam

My name is Onica Ndwambi; I am a registered student at the University of South Africa (Unisa) I am writing to request permission to conduct a study at your institution. I am in the process of writing my Master's Dissertation. The title of my study is **Grade 12 Biology: A factor in academic achievement in Biological and Natural Science in undergraduate nursing studies.**

The study will be conducted by completing a checklist from college archive records and a questionnaire to the first and second year Biological Natural Science (BNS) students. This will only be done after the institution has provided permission to peruse the students' records and after the Higher Degrees Committee of the Department of Health Studies (Unisa) grant Ethics approval and my supervisors are satisfied with the intended research study. The identity of the institution and the respondents will not be revealed. No any other unauthorized person will have an access to the data. All the materials will be discarded ones the study is completed and accepted by my supervisors.

Findings of the study will be presented to the institution on completion of the study. I will not commence with the study until I have received ethical approval, and I will also provide you with the copy of the letter of ethics approval before commencement of the study, should my request be granted.

Your approval to conduct the study will be greatly appreciated. I can be contacted at any time to answer any queries or concerns that you may have. You may contact me at

082 392 1950 (cell phone number) or at my work telephone number: 012 319 5633. My email address: onikandwambi@yahoo.com.

Supervisors: Dr JC Lubbe and Prof. L Roets
University of South Africa
Tel: 012 429 6020
E-mail : lubbejc1@unisa.ac.za
: roetsl@unisa.ac.za

ANNEXURE C

Letter of permission to conduct the study from Gauteng Department of Health



GAUTENG PROVINCE
Health
REPUBLIC OF SOUTH AFRICA

Enquiries : Ms. N.B Mothokoa
Tel : 012 319 5717
Fax : 012 319 5742
E-mail norma.mothokoa@gmail.com
Reference Number: 8/1/7/5/2

Ms OM Ndwambi
SG Lourens Nursing College
Department 6

SUBJEC : Request for permission to collect data at SG Lourens Nursing College

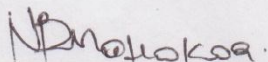
This serves as a response to your request in undertaking the study on Grade 12 Biology: A factor in the academic achievement in Biological Natural Science in undergraduate nursing studies.

Permission is hereby granted for collection of data as indicated in your proposal.

Please take note of the following:

- All information and data collected should be treated as confidential and ethical considerations adhered to as stated in the proposal.
- At the end of the study kindly furnish the college with the study results.

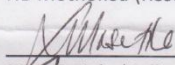
Thank you



NB Mothokoa (Research Committee Chairperson)

14.08.2015

Date



Ms MP Tjale (College Principal)

2015/08/14

Date

SG Lourens Nursing College, Private Bag X755, Pretoria, 0001 Tel: (012) 319 5600 Fax: (012) 319 5699



ANNEXURE D

Information leaflet

PO BOX 11135

Suiderburg

0055

onikandwambi@yahoo.com

JULY 2015

Dear Participant

Good day. My name is Onica Ndwambi. And I am a registered student at the University of South Africa; I intend to conduct a study in relation to Biological and Natural Sciences. I hereby request you to volunteer to participate in the study. I intend to disseminate these findings to the stakeholders concerning recruitment, selection and the education of nursing students.

You will be asked to complete a questionnaire. Your name will not be on the questionnaire and all the information that you gave will be confidential. This questionnaire will only take 10 minutes of your time. You will not be remunerated but the information will be used to benefit other students in future. The results might be published, but your information will not be able to be tracked back to you. I will appreciate your honest answers to the questions in the questionnaire.

You may withdraw from the study at any time, without fear of being victimized. If you agree to participate please complete the attached questionnaire. After completion please place the questionnaire into the specifically marked survey box.

Please feel free to contact me at (0823921950) if you have any questions regarding this research study.

Yours Sincerely

OM Ndwambi

ANNEXURE E

Consent letter

Nurse Educator

SG Lourens Nursing College

CONSENT FORM

Title: Grade 12 Life Science: A factor in academic achievement in Biological and Natural

Science in basic nursing studies

Principal investigator: Ms OM Ndwambi

I, the undersigned, agree to participate in the above-mentioned research study. I confirm that the researcher has explained the following to me:

- My participation in the study is voluntary and I may withdraw and discontinue participation at any time without penalty.
- I will not be paid for my participation, and if I feel uncomfortable in any way during the completion of a questionnaire, I have the right to decline to answer any further questions.
- Participation involves completing a questionnaire by the participants.
- The researcher will not identify me by name in any of the reports and that my confidentiality as a participant in the study will remain secured.
- All materials containing identifying information will be destroyed once the completed study is accepted.

I have read and understood the information provided to me and had all my questions answered to my satisfaction, and I voluntarily agree to participate in the study.

If I have any questions about the research, I will contact the person mentioned below:

OM Ndwambi (Researcher): 082 392 1950

onikandwambi@yahoo.com

<hr/> Participant's Name	<hr/> Participant's Signature	<hr/> Date
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<hr/> Witness Name	<hr/> Witness Signature	<hr/> Date
---------------------------	--------------------------------	-------------------

ANNEXURE F

Checklist

DATA CHECKLIST FROM THE COLLEGE ARCHIVE

Grade 12 Life Science: A factor associated with academic achievement in Biological and Natural Science of basic nursing studies

Doc NO	Gender		Age			High school		Symbol for Biology/ Life science in standard 10 / grade 12								English symbol obtained in grade 12							BNS exam marks
	F	M	18 - 25	26 - 33	34 &>	Public	Private	Not studied	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
	1	2	1	2	3	1	2	0	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
1																							
2																							
3																							
4																							
5																							
6																							
7																							
Total																							

Key: BNS = Biological and Natural Science

ANNEXURE G

Questionnaire

Dear student

Thank you for agreeing to participate in this research study. Please complete this questionnaire as honest as you can.

Number of questionnaire

For office use

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Instructions:

1. Please answer all the questions by indicating with an (X) next to your answer.

For office use

Example: Do you like apple

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
---	-----------------------------

--	--	--

2. Please answer according to your own opinion.
3. Please fill in the questionnaire alone, no group discussion allowed.
4. Please return the completed questionnaire in the box provided.

For the purpose of this questionnaire a student nurse means: first and second year undergraduate nursing students studying Biological and Natural Science, registered for the nursing diploma, according to regulation R425 as amended.

PLEASE ANSWER ALL QUESTIONS.

SECTION A: DEMOGRAPHIC DATA

FOR OFFICE USE ONLY

1. How old are you?

Age	Answer
1.1. 18 – 21 years	1
1.2. 22 – 25 years	2
1.3. 26 – 29 years	3
1.4. 30 – 33 years	4
1.5. 34 years and older	5

--

2. What is your marital status?

Marital status	Answer
2.1. Married	1
2.2. Divorced	2
2.3. Never married	3
2.4. Separated	4
2.5. Cohabitation (Living together)	5

3. What language do you speak at home?

Language	Answer
3.1. Tswana – Sotho	1
3.2. Nguni	2
3.3. Venda – Tsonga	3
3.4. Afrikaans	4
3.5. English	5

4. What is your place of stay whilst studying nursing?

Place of stay	Answer
4.1. College residence	1
4.2. Private. e.g. Renting flat	2
4.3. Own home	3
4.4. Parents' home	4
4.5. Renting room	5

5. Where do you mostly study? **Choose only one option.**

Place of stay	Answer
5.1. Room in my college residence	1
5.2. Room in my own flat/home	2
5.3. Room in my parents' flat/home	3
5.4. The library	4
5.5. Together with a group of other students	5

6. Do you think that the place where you study influenced your results in BNS?

Yes	No
1	2

7. If your answer in question 6 is **YES**, please motivate your answer.

8. What type of school did you attend?

School	Answer
8.1. Public	1
8.2. Private	2

9. What is your gender?

Gender	Answer
9.1. Female	1
9.2. Male	2

10. Did you study **Biology /Life Science in Grade 12?**

Yes	No
1	2

IF YOUR ANSWER IS NO GO TO QUESTION 10.5.

10.1. If your answer is **YES**

10.1.1. When did you pass?	Answer
10.1.1.1. A year ago	1
10.1.1.2. Two years ago	2
10.1.1.3. Three years ago	3
10.1.1.4. Four years ago	4
10.1.1.5. Over five years	5

10.2. What symbol did you obtain in **Biology/Life science?**

Symbol	Answer
10.2.1. A	1
10.2.2. B	2
10.2.3. C	3
10.2.4. D	4
10.2.5. E	5
10.2.6. F	6
10.2.7. G	7
10.2.8. Did not pass	8

10.3. If your answer is **YES**, I studied **Biology/ Life Science in school**: Do you think **PASSING** Biology /Life Science influenced your academic performance in Biological and Natural Science?

Yes	No
1	2

10.4. If your answer in 10.3 is **YES**, please motivate your answer.

10.5. If your answer is **NO**, I did not study **Biology/ Life Science** at School: Do

you think **NOT PASSING** Biology / Life Science in grade 12 influenced your academic performance in Biological and Natural Science?

Yes	No
1	2

11. Why do you think you **PASSED** Biological and Natural Science (BNS)? **Mark all the applicable choices.**

Reason	Answer
11.1. Hard work	
11.2. Consultation with others	
11.3. Good time management	
11.4. Attending class	
11.5 Had a good lecturer	

12. Why do you think you did **NOT PASS** Biological and Natural Science (BNS)?

Mark all the applicable choices.

Reason	Answer
12.1. Poor class attendance	
12.2. Poor study methods	
12.3. Poor time management	
12.4. Personal/ social problems	
12.5. Lecturer not good	
12.6. My English language proficiency	
12.7. No Biology/Life Sciences background knowledge	

13. Do you think **Biology/Life Science** is an important **PREREQUISITE** for admission into the nursing program?

Yes	No
1	2

--

14. Indicate next to your choice:

How do you **RATE** the value of this subject (**Life Science**) as an important pre-requisite to study Biological and Natural Science at College?

Rating	Answer
14.1. Highly recommended	1
14.2. Recommended	2
14.3. Not sure	3
14.4. Not recommended	4

--

15. Please **MOTIVATE** your answer given in question 14

16. Indicate with an X next to your choice:

How do you rate the value of a **SIMULATION LABORATORY** in relation to understanding BNS?

Rating	Answer
16.1. Highly recommended	1
16.2. Recommended	2
16.3. Not sure	3
16.4. Not recommended	4

17. Please **MOTIVATE** your answer given in question 16

18. How do you rate the value of the use of **COMPUTER PROGRAMS LIKE PRIMAL PICTURES** in understanding BNS?

Rating	Answer
18.1. Highly recommended	1
18.2. Recommended	2
18.3. not sure	3
18.4. Not recommended	4

19. Please **MOTIVATE** your answer given in question 18

20. How do you rate the level of **KNOWLEDGE** of your BNS' lecturers?

Rating	Answer
20.1. Excellent	1
20.2. Good	2
20.3. Average	3
20.4. Poor	4

21. Please **MOTIVATE** your answer in question 20.

22. Do you think the library has **enough** study material to assist you in understanding BNS?

Yes	No
1	2

23. Do you think that the **prescribed study material** provides enough information to assist you in understanding BNS?

Yes	No
1	2

24. If your answer is NO in question 23, what do you suggest should be added?

25. Please write down any **comments or suggestions** that you may have.

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

ANNEXURE H

Letter from the editor

Cell/Mobile: 073-782-3923

53 Glover Avenue
Doringkloof
0157 Centurion

9 December 2016

TO WHOM IT MAY CONCERN

I hereby certify that I have edited Onica Mankebe Ndwambi's master's dissertation,
Grade 12 Life Science: a factor in the academic achievement in Biological and Natural Science in basic nursing studies, for language and content.

IM Cooper

Iauma M Cooper
192-290-4